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Guided Missile Personnel Research: Report No. 4

A COMPARATIVE ANALYSIS OF MISSILEMAN TASKS FOR FIVE GUIDED MISSILES

Volume 2. Appendices B, C, D, and E

Behavior Statements and Behavioral Categories

Prepared under the Sponsorship of the

BUREAU OF NAVAL PERSONNEL

AMERICAN INSTITUTE for RESEARCH

PITTSBURGH, PENNSYLVANIA

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B U R E A U O F N A V A L P E R S O N N E L

Technical Bulletin

A COMPARATIVE ANALYSIS OF MISSILEMAN TASKS FOR FIVE GUIDED MISSILES:

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TESTING AND ADJUSTMENT PROCEDURES:

AND HANDLING, ASSEMBLY AND SERVICING ACTIVITIES:

BEHAVIOR STATEMENTS AND BEHAVIORAL CATEGORIES

American Institute for Research
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C O N T E N T S

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APPENDIX B

TESTING AND ADJUSTMENT: TASKS AND ASSOCIATED BEHAVIOR STATEMENTS, MISSILES CONSIDERED SEPARATELY

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TESTING AND ADJUSTMENT: TASK AND ASSOCIATED BEHAVIOR STATEMENTS, MISSILES CONSIDERED SEPARATELY

Coding System

Each task and behavior statement was coded. This facilitated the identification of a particular statement when it was placed on a separate card and sorted with other behavior statements describing other tasks in the same missile and in different missiles. The coding system is as follows:

a) The first letter indicates the missile concerned:
T = Terrier, R = Regulus, S = Sparrow, P = Petrel,
D = Dove.

b) The second and/or third letter indicates the task concerned:
(1) Tasks concerned with the testing and adjustment of the missile were lettered A, B, C, etc.
(2) Tasks concerned with the testing and adjustment of missile test equipment were lettered AT, BT, CT, etc.
(3) Tasks concerned with the testing and adjustment of external guidance equipment were lettered AE, BE, CE, etc.

c) The number following the letters indicates the number of a behavior statement used to describe a particular task.

Examples:

TA 1 indicates Terrier, Task A (a task performed on a missile), Behavior Statement 1.

TAT 5 indicates Terrier, Task AT (a task performed on test equipment), Behavior Statement 5.

RBE 7 sub indicates Regulus, Task BE (a task performed on external guidance equipment), Behavior Statement 7, ("sub" indicates that the behavior is one that would probably be performed by a missileman assigned to submarine duty).

Task TA Missile Control System Operational Check - Using a Programmed Console (BOFTE)

TA 1 Turn power switch on, and warm-up console, Visually check indicator lights.

TA 2 Place missile in test stand in proper attitude. Connect missile exhaust to a muffler.

TA 3 Install control surface transducers in sockets. Inspect mating surfaces to make sure they are free from dirt or foreign particles.

TA 4 Set transducer protractor to servo zero: Insert control surface into socket opposite the transducer and manually rotate to each extreme position. Note protractor dial reading at each extreme and the midpoint. If necessary loosen zero adjustment and rotate transducer until zero coincides with midpoint.

TA 5 Make necessary microwave, electric cable, and air hose connections between the missile and the test console.

TA 6 Set up and use a multi-channel recording oscillograph to record signals. Manually position transducers to specified angular positions and adjust recorder gain so that prescribed pen deflection is obtained.

TA 7 Set up a multi-channel pen recorder. Zero pens and check writing ability of all pens.

TA 8 Interpret oscillograph recordings to determine cause of control system malfunctioning.

TA 9 Set controls on test console and depress test start switch. Observe elapsed time meter and go-no-go indicators in the course of an automatically programmed test. At specific times manually rotate missile to prescribed roll attitudes. Record go-no-go indications.

Task TB Missile Control System Maintenance Check - Using a Test Console and Radar Beam Simulator (Moritoring Panel and Radar Beam Simulator)

TB 1 Inspect missile for proper assembly and evidence of injury of mishandling. Install, position, and electrically ground the missile in the missile test stand. Check switches and valve positions for correct initial position. Check for jumpers between specified points. Check log for previous servicing.

TB 2 Install control surface protractors and mechanically zero indicators.

TB 3 Make all pneumatic, hydraulic, microwave, and electric cable connections between the missile and the test console.

TB 4 Set up and use standard vacuum pump with associated gage, tubing, and missile pressure probe adaptor, so that missile high altitude operation may be simulated.

TB 5 Set controls and warm up test console. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator settings.

TB 6 Set switches which inject test signals into control system components and manually rotate missile in test stand; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

TB 7 Compute system response parameters from recorded test data. The computations involve simple alegebraic or arithmetic manipulation.

TB 8 Adjust wing trim potentiometers for wing position indicator zero at center of mechanical back lash. Ground servo amplifier input terminals before adjustment is made.

TB 9 Adjust phasing potentiometer control knobs for minimum signal voltages as read on a built-in meter. Adjustments are made alternately on the two channels for best compromise minimum voltage.

TB 10 Set up and use a standard oscilloscope for monitoring af signals.

TB 11 Set up and use a single-channel recording oscillograph to monitor af signals.

TB 11a Set up, voltage calibrate and use a single-channel recording oscillograph to determine rate of wing motion.

TB 11b Use a single-channel recording oscillograph to measure frequency of an af signal.

TB 12 Make necessary microwave, and electrical connections between missile, test panel, and radar beam simulator.

TB 13 Set switches, adjust controls and warm up radar beam simulator. Adjust attentuators so that specified outputs, in db, are obtained at some remote point; involves simple arithmetic operations.

TB 14 Terminate missile checkout by shutting down test equipment. Hydraulic, air, and electrical power must be terminated in proper sequence and all lines and cabling between console and missile removed.

Task TC Guidance Receiver Maintenance Check - Using a Test Console (Receiver Test Panel)

TC 1 Make necessary electrical cable and waveguide connections between the test consoles and the receiver. Connections should be made in proper sequence and according to prescribed procedures.

TC 2 Set controls and warm up test console. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator settings.

TC 3 Tune a klystron local oscillator for a stable mode of operation at a given frequency and power level.

TC 4 Set up and use a standard oscilloscope to determine the phase relationships between two af signals.

TC 4a Interpret Lissajous figures as viewed on an oscilloscope screen in terms of the phase angle between two signals.

TC 5 Set switches which inject test signals into receiver and read output signal levels on built-in meters. Record meter readings and compare with specified values.

TC 6 Compute system response parameters from recorded test data. The computations involve simple algebraic or arithmetic manipulation.

TC 7 Set up and use a multi-channel recording oscillograph to monitor transient signals. Determine the system response from the test records.

TC 8 Use a stop watch to determine delay times by timing the period between a manual switch actuation and relay contacts closing.

TC 9 Set up and use a vibration test stand to excite missile receiver at a specified frequency and amplitude during a series of functional tests.

Task TAT Power Supply (Radar Beam Simulator) Maintenance Check

TAT 1 Use ohmmeter to measure resistance to ground at specified test points within the chassis. Compare with prescribed values.

TAT 2 Connect and use variac to adjust line voltage.

TAT 3 Adjust time delay relay for specified delay at normal operating temperature.

TAT 4 Set up and use standard oscilloscope to monitor power supply output and determine presence of undesired oscillations. Use series blocking capacitor for high voltage isolation.

TAT 5 Adjust power supply potentiometer (screwdriver) until output voltage as measured by standard multimeter is a specified value.

TAT 6 Use test load resistor, bucking battery, and voltmeter to determine power supply regulation as a function of supply voltage variation. Use variac to vary supply voltage between specified limits.

TAT 7 Set up and use standard oscilloscope to measure power supply output ripple voltage.

Task TBT FM Generating and Phasing Chassis
(Radar Beam Simulator) Maintenance Check

TBT 1 Remove chassis from cabinet and make necessary electrical cable connections.

TBT 2 Turn on power and warm up equipment.

TBT 3 Set switches as prescribed and observe relay positions.

TBT 4 Set up and use synchroscope with a high frequency probe to monitor pulse waveforms. Compare waveforms obtained with descriptions or photographs in manual. If necessary perform potentiometer (screwdriver) adjustment. Use synchroscope high frequency probe.

TBT 5 Perform potentiometer (screwdriver) adjustment using standard multimeter until voltages as measured at test points are of specified value.

TBT 6 Make necessary electrical cable connections between beam simulator and beam simulator test set. Set switches and adjust potentiometer control knobs as specified.

Task TCT Automatic Frequency Control

(Radar Beam Simulator) Maintenance Check

TCT 1 Remove chassis from cabinet and make necessary electric cable connections.

TCT 2 Turn on power and warm up equipment.

TCT 3 Connect signal generator, and VTVM to specified points within chassis. Terminate signal generator cable with specified resistor.

TCT 4 Set up and use rf signal generator and standard VTVM to adjust coil tuning slug position for peak output, using built in attenuator in signal generator to keep output voltage at desired value.

TCT 5 Check AFC operation by using heterodyne frequency meter in test unit to measure difference frequency. If necessary adjust coil tuning slug position until specified frequency is obtained. Set controls and switches to prescribed positions.

Task TDT Klystron Modulator

(Radar Beam Simulator) Maintenance Check

Procedure is classified SECRET and will not be described in this report.

Task TET Pulse Code Chassis

(Radar Beam Simulator) Maintenance Check

Procedure is classified SECRET and will not be described in this report.

Task TFT Operational Check of Radar Beam Simulator -

Using Unprogrammed Test Console (Guidance Analyzer)

TFT 1 Make necessary microwave connections between microwave source and test console.

TFT 2 Turn on power, warm up console, and set controls. Check fuse indicator lights. Read line voltage on built-in meter and set switch accordingly. Read power supply output voltages on built-in meters and if necessary perform potentiometer adjustment to correct voltages.

TFT 3 Set up and adjust synchroscope sweep lengths (marker intervals) by performing screwdriver adjustment of tuning capicitors.

TFT 4 Set up and use synchroscope to measure separation between pulses and pulse groups.

TFT 5 Set up and use synchroscope to observe pulse shape, jitter, and amplitude variations from pulse to pulse.

TFT 6 Measure rf power input level to special radar receiver by calibrating if stages and using substitution procedure according to specified instructions.

TFT 6a Check that radar receiver tuning is tuned to frequency of signal source.

TFT 6b Perform potentiometer adjustment of klystron repeller voltage to peak if output.

TFT 6c Set switch to feed internally generated signal into if amplifier; adjust receiver bias potentiometer until specified output is obtained with specified input. Read voltages on a built-in VTVM.

TFT 6d Adjust built-in rf attenuator until specified if output is obtained as read on a built-in VTVM.

TFT 6e Subtract known calibration constant from attenuator setting to determine rf input power.

TFT 6f Make microwave connections between radar beam simulator and receiver.

TFT 7 Set up and use a direct reading, built-in VTVM for measuring PRF, and F.M. deviation of input signal.

TFT 8 Set up and use a synchroscope, and built-in rf attenuator to determine modulation, in db, of input signal by determining db difference between modulation peaks and valleys.

TFT 9 Use a built-in absorption-type wattmeter to measure frequency of microwave signal.

TFT 10 Use a synchroscope and special built-in discriminator to measure frequency pulling of rf source by setting and adjusting switches and controls, observing discriminator output on synchroscope, and multiplying peak to peak amplitude of this signal by a known calibration constant.

TFT 11 Measure F.M. phase of microwave signal with respect to beam nutation by setting and adjusting switches and controls, reading a built-in VTVM, using specially prepared tables and a specified procedure.

Task TGT Radar Beam Simulator Test Console

(Guidance Analyzer) Operational Maintenance

TGT 1 Turn on power, warm up console and set controls. Check fuse indicator lights. Read line voltage on built-in meter and set switch accordingly. Read power supply output voltages on on built-in meters and if necessary perform potentiometer adjustment to correct voltages.

TGT 2 Make necessary microwave connections between microwave source and test console.

TGT 3 Tune radar receiver (klystron local oscillator) to frequency of incoming signal.

TGT 4 Adjust frequency and frequency deviation of internally generated F.M. pulse signal by setting switches, and controls, setting up and using a specially calibrated VTVM, and if necessary performing a screwdriver potentiometer adjustment.

TGT 5 Adjust receiver AGC voltage by setting switches and controls, and adjusting potentiometers (screwdriver) for specified reading on built-in meters.

TGT 6 Apply ac voltage of specified value to klystron repeller and use a built-in special discriminator in conjunction with a synchroscope and VTVM to determine a frequency pulling calibration constant. This procedure includes setting switches and controls, building a simple R-C network for voltage dividing and coupling purposes, and performing simple arithmetic computations.

TGT 6a Check that radar receiver tuning is tuned to frequency of signal sources.

TGT 7 Calibrate a test console F.M. deviation meter by applying an externally generated pulse signal of specified F.M. deviation, pulse amplitude and width to jack; perform screwdriver potentiometer adjustment until prescribed meter reading is obtained.

TGT 8 Set up and use a built-in VTVM, set and adjust controls according to a specified procedure to adjust and equalize test console circuit phase shifts.

TGT 9 Determine calibration constant for use in rf power level measurements with test console.

TGT 9a Check that radar receiver tuning is tuned to frequency of signal source.

TGT 9b Perform potentiometer adjustment of klystron repeller voltage in order to peak if output.

TGT 9c Set switch to feed internally generated signal into if amplifier and adjust receiver bias potentiometer until specified output is obtained with specific input. Read voltages in a built-in VTVM.

TGT 9d Adjust built-in rf attenuator until specified if output is obtained as read on built-in VTVM; read attenuator to determine calibration constant.

TGT 9e Make microwave connections between rf signal source and receiver.

TGT 10 Adjust and equalize phase shifts of test console circuits by setting and adjusting controls according to a specialized procedure and reading voltages on a built-in VTVM.

Task THT Test Console (Monitoring Panel) Maintenance Check

THT 1 Set controls and warm up test console. Throw switches in sequence to intial positions and adjust potentiometer control knobs in sequence to specified dial or indicator setting.

THT 2 Make necessary electric cable connections from test console to power sources.

THT 3 Use a standard stop watch to calibrate an elapsed time meter.

THT 4 Set switches and potentiometer control knobs to specified settings. Install jumpers between cable plug pins. Observe multimeter readings, built-in meter, and lamp indications to check performance of test console.

THT 5 Set up and use a standard built-in oscilloscope to monitor ac and dc steady state signals.

THT 6 Set up and use a standard oscilloscope to determine the phase angle between two af signals.

THT 6a Interpret Lissajous figures as viewed on an oscilloscope screen in terms of phase angle between two signals.

THT 7 Set up and use a dual-beam oscilloscope or a standard oscilloscope with an electronic switch to determine the phase angle between two af signals.

THT 7a Compute phase angle between two signals from measurements of the displacement of the signal peaks.

THT 8 Set up a Graham variable speed drive to drive a potentiometer and/or a servo generator at specified speeds of rotation.

THT 9 Set up and use a standard built-in pen recording oscillograph for monitoring ac and dc signals.

Task TIT Control System Test Console (Monitoring Panel)

Operational Check - Using an Unprogrammed Test Console

(Monitoring Panel Test Unit)

TIT 1 Set controls and warm up test console. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator settings.

TIT 2 Make electrical cable connections between the test console and the console test unit according to prescribed procedure.

TIT 3 Set switches which inject test signals into console test unit and record response as measured by built-in indicating or recording instruments and indicating lamps. Meter readings and lamp indications are recorded and compared with specified normal values.

TIT 4 Shutting down test equipment and disconnecting cabling.

Task TJT Test Console (Monitoring Panel Test Unit)

Maintenance Check

TJT 1 Adjust a regulated power supply for correct output voltage by making a screwdriver adjustment to a potentiometer while measuring the output with a standard VTVM.

TJT 2 Adjust two regulated power supplies for a minimum specified difference voltage by alternately and in proper sequence adjusting (screwdriver) two control potentiometers and reading a VTVM.

TJT 3 Balance a push-pull dc amplifier by adjusting balancing potentiometer control knobs for zero output(VTVM) with zero input signal. Change vacuum tube if balance cannot be obtained.

TJT 4 Adjust a sensitive polarized dc relay for proper minimum activating voltage by adjusting relay contacts with pliers. Successive adjustments must be made until activating voltage, as measured with a VTVM, is within specified limits.

Task TKT Test Console (Receiver Test Panel) Maintenance Check

TKT 1 Use a standard multimeter for checking circuit continuity.

TKT 2 Adjust a regulated power supply for proper output voltage. Connect a special voltage calibration load to the power supply output terminals. Vary a potentiometer control knob for specified output voltage as read on a built-in VTVM.

TKT 3 Use a standard VTVM for checking the ripple voltage output of a regulated power supply.

TKT 4 Set up and use an audio oscillator and a VTVM for determining the output impedance of a regulated power supply. The oscillator must be connected to the power supply through a special R-C network and a special voltage calibration load.

TKT 4a Compute circuit impedance from recorded test data. The computations involve simple algebraic or arithmetic manipulation.

TKT 5 Set a relay supply voltage to a specified value by adjusting a potentiometer with screwdriver until the desired voltage value is read on a VTVM.

TKT 6 Set up and use a standard af signal generator and VTVM to adjust an af reference signal voltage. Make adjustment by varying a potentiometer for a specified voltage indicated on a VTVM.

TKT 7 Use a standard af signal generator and a standard oscilloscope to calibrate a phase shifting network.

TKT 8 Interpret Lissajous figures as viewed on an oscilloscope screen in terms of phase difference between the two signals.

TKT 9 Calibrate built-in ac VTVM's. Set up and use a standard audio oscillator or dc laboratory power supply as voltage source. Adjust calibrating potentiometer (screwdriver) until VTVM reading is the same as the input voltage as indicated on a known accurate voltmeter.

Task RA Power Supply
(Bi-Polar Guidance Set) Maintenance Check

RA 1 Make electrical cable connections between missile components.

RA 2 Use standard voltmeters to measure voltages at test points. Determine if measured voltages are within 5% of specified values.

Task RB Guidance Receiver
(Bi-Polar Guidance Set) Maintenance Check

RB 1 Set up and use microwave heterodyne frequency meter to measure frequency of signal source.

RB 1a Adjust lighthouse local oscillator frequency by manually adjusting tuning cavity slug.

RB 2 Calibrate heterodyne frequency meter by zero-beating against internal crystal oscillator.

RB 3 Use external crystal detector and milliameter to measure high frequency current.

RB 4 Set up and use a synchroscope for monitoring a video signal.

RB 5 Tune a resonant cavity by adjusting (screwdriver) a tuning slug while observing synchroscope.

RB 6 Adjust the coupling between a local oscillator and a crystal mixer for desired crystal current by manually turning coupling loop rod.

RB 7 Set up and use a standard microwave signal generator.

RB 8 Set up and use standard pulse generator for triggering purposes.

RB 9 Adjust if transformers for peak response using standard signal generator, triggered by standard pulse generator, as a signal source and a synchroscope as an output monitor. Transformers are slug (screwdriver) tuned.

RB 10 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RB 11 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RB 12 Set up and use a synchroscope to measure signal to noise ratio.

RB 13 Set up and use a synchroscope to measure pulse widths.

Task RC Decoder and Program Unit

(Bi-Polar Guidance Set) Maintenance Check

RC 1 Set up and use a synchroscope to monitor and determine frequency of a pulse source.

RC 2 Set up and use a standard microwave signal generator.

RC 3 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RC 4 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RC 5 Connect and disconnect rf cables, energize and deenergize relays, according to prescribed procedure while observing synchroscope output.

Task RD Director Unit (Bi-Polar Guidance Set)

Maintenance Check

RD 1 Set up and use a standard microwave signal generator.

RD 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RD 3 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RD 4 Use a standard voltmeter to measure voltage available at test point after connecting test load resistor.

RD 5 Set up and use a synchroscope to monitor pulse signals.

RD 6 Set up and use a synchroscope to monitor the coincidence of two pulse groups. Adjust delay by turning knob until coincidence occurs.

Task RE Encoder-Transmitter

(Bi-Polar Guidance Set) Maintenance Check

RE 1 Set up a microwave transmitter for output tests by using rf test load, special detector, and external trigger source.

RE 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RE 3 Set up and use a synchroscope to monitor and measure pulse amplitude, width, and spacing.

RE 4 Calibrate a heterodyne frequency meter by zero-beating against an internal crystal oscillator.

RE 5 Calibrate an absorption-type frequency meter and a microwave spectrum analyzer (klystron oscillator) against an external frequency standard.

RE 6 Observe the magnetron output frequency on a microwave spectrum analyzer and if required perform screwdriver adjustment of tuning control.

RE 7 Set up and use an rf power meter to measure average transmitter power output.

RE 8 Use charts or nomographs to transform test data.

RE 9 Compute peak power by performing simple algebraic operations including logarithmic manipulations and use of duty cycle concept.

Task RF Missile Control System

(Bi-Polar Guidance Set)

Installation and Preliminary Operational Check

RF 1 Mount control units in missile frame.

RF 2 Make specified electrical and microwave connections between control units and other missile components.

RF 3 Perform visual, mechanical, and simple electrical checks or missile components according to specified procedure.

RF 4 Use a multimeter to make continuity checks.

RF 5 Set switch to energize power source and check presence of voltage by observing tube filaments and listening for blower operation.

RF 6 Use a standard voltmeter to measure voltages appearing at test points.

RF 7 Use a standard milliameter to measure current at test point.

RF 8 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RF 9 Set a switch and observe prescribed warm-up time.

RF 10 Use a calibrated microammeter to read current.

RF 11 Use a neon rf indicator to determine if transmitter is operating.

RF 12 Calibrate a microammeter by determining necessary series calibrating resistance; use ammeters, potentiometers, and battery connected to test points as specified; measure resistance value with ohmmeter.

Task RG Guidance Receiver

(Bi-Polar Guidance Set) Operational Check

RG 1 Set up and use a standard microwave signal generator.

RG 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RG 3 Set up and use special coded video pulse pair generator for triggering microwave signal generator (only one front panel control involved).

RG 4 Set up and use a synchroscope to compute receiver signal to noise ratio.

Task RH Decoder and Program Unit

(Bi-Polar Guidance Set) Operational Check

See Decoder and Program Unit (Bi-Polar Guidance Set) Maintenance Check - RC 1 through RC 5

Task RI Director Unit

(Bi-Polar Guidance Set) Operational Check

See Director Unit (Bi-Polar Guidance Set) Maintenance Check - RD 1 through RD 6

Task RJ Encoder-Transmitter

(Bi-Polar Guidance Set) Operational Check

RJ 1 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RJ 2 Set up and use a synchroscope to monitor and measure pulse amplitude, width, and spacing.

RJ 3 Observe magnetron output frequency on microwave spectrum analyzer and if required perform screwdriver adjustment of tuning control.

RJ 4 Set up and use an rf power meter to measure average transmitter power output.

RJ 5 Use charts or nomographs to transform test data.

RJ 6 Compute peak power by performing simple algebraic operations including logarithmic manipulations and use of duty cycle concept.

Task RK Director Unit (Bi-Polar Guidance Set)

Output Polarity Operational Check

RK 1 Set up and use a standard microwave signal generator.

RK 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RK 3 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RK 4 Use a standard voltmeter to measure the voltage available at a test point after connecting a test load resistor.

RK 5 Observe control surface direction of motion and determine if its motion is in desired direction for proper operation.

Task RL Missile Control System

(Bi-Polar Guidance Set) Final Operational Check

RL 1 Set up and warm up test console. Switch on missile power and wait until prescribed warm-up period has elapsed before operating delay switch.

RL 2 Pressurize container with air at 5 PSI.

RL 3 Set up and use a synchroscope to monitor and determine frequency of a low frequency pulse source.

RL 4 Set up and use a standard microwave signal generator.

RL 5 Set up and use a special dual video pulse generator for triggering a pulse signal generator.

RL 6 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RL 7 Set up and use a synchroscope to monitor coincidence of two pulse groups. Adjust the delay by turning a knob until coincidence occurs.

RL 8 Set switches and dials which control the radiated signal into the missile control system and note system response as measured by indicating instruments or control surface position.

Task RM Flight Path Controller

(Bi-Polar Missile) Displacement Gain Check

NOTE: The behaviors listed under RN, RO, RP, RQ and RR were written from preliminary data collected in the field. Field information also indicates that the Flight Path Controller (FPC) is due to be replaced; hence the specific behaviors in RN, RP, RQ and RR can be considered only temporarily valid. The new equipment, however, will be required to perform functions similar to the present FPC and maintenance of the new equipment may resemble the FPC's maintenance. The behaviors now being performed are included in the present report.

It should also be noted that behaviors other than those indicated in RN, and RO are probably required for complete maintenance of the FPC. However, the limited information available does not permit the specification of these additional behaviors.

RM 1 Make necessary electric cable connections between equipment and special test set. Set switches as prescribed.

RM 2 Manipulate front panel control to adjust dc output voltage of special test set. Read output voltage on built-in meter.

RM 3 Set up and use standard VTVM to measure output voltage for switch positions.

RM 4 Plot input and output voltages for various switch settings to obtain family of gain curves. Compare obtained curves with prescribed curves.

Task RN Flight Path Controller

(Bi-Polar Missile) Rate Gain Check

RN 1 Make necessary electric cable connections between equipment and special test set. Set switches as prescribed.

RN 2 Use stop watch to determine time required for voltage, as indicated on built-in meter, to go from maximum to minimum.

RN 3 Use built-in voltmeter to determine maximum and minimum values of a slowly varying voltage.

RN 4 Set up and use standard VTVM to measure ac output voltage.

RN 5 Determine rate gain by performing simple arithmetic operations on known data.

RN 6 Plot rate gain for various switch settings to obtain rate gain graph. Compare obtained curves with prescribed curves.

Task RO Flight Path Controller

(Bi-Polar Missile) Operational Check

RO 1 Set up and use a standard microwave signal generator.

RO 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RO 3 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RO 4 Set controls as prescribed. Set up and use standard oscilloscope to monitor ac signal.

RO 5 Set controls as prescribed. Observe control surface movement.

Task RP Effect of Dropout Relay on Flight Path Controller

(Bi-Polar Missile) Operational Check

RP 1 Set up and use a standard microwave signal generator.

RP 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RP 3 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one from panel control involved).

RP 4 Set up and use standard oscilloscope to monitor ac signal. Observe signal on scope while removing rf input to missile by disconnecting coaxial cable.

RP 5 Disconnect rf signal to missile by disconnecting coaxial cable. Observe control surface movement.

Task RQ Effect of Dropout Relay on Flight Path Controller

(Bi-Polar Missile) Maintenance Check

RQ 1 Set up and use a standard microwave signal generator.

RQ 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RQ 3 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RQ 4 Set up and use standard oscilloscope to monitor ac singal. Observe signal on scope while removing rf input to missile by disconnecting coaxial cable.

RQ 5 Set up and use standard multi-channel oscillograph to obtain record of voltages which appear at designated circuit points when rf input to missile is disconnected by disconnecting coaxial cable.

REGULUS

Task RR Receiver (Radio Command Missile)

Operational Check

NOTE: Written from very limited information; the only material available was a preliminary Training Outline.

RR 1 Remove unit from metal pressurized case after bleeding air pressure and make necessary electrical cable connection. Warm up unit.

RR 2 Set controls as specified and insert desired crystals into crystal sockets.

RR 3 Set up and use rf signal generator and VTVM for signal to noise ratio tests.

RR 4 Set up and use a VTVM and an rf signal generator with prescribed modulation, for signal to noise ratio tests.

RR 5 Set up and use rf signal generator, and VTVM to determine the magnitude of rf input to saturate receiver limiters.

Task RS Receiver (Radio Command Missile) Operational Check -

Unprogrammed, No Console

RS 1 Remove unit from pressurized cabinet after bleeding air pressure, and make necessary electrical cable connections. Warm up unit.

RS 2 Set up and use a VTVM and a standard multimeter to measure voltages appearing at designated test points.

RS 3 Use charts and nomographs to transform test data.

RS 4 Set up and use an R-C transmitter to transmit a test signal for a receiver check.

RS 5 Reinstall unit in its cabinet and pressurize it to specified air pressure using a hand pump.

RS 6 Make a control function test by operating the control panel at the R-C transmitter and visually inspect the response of the missile control surfaces and other controlled devices. Read built-in meters and measure voltages appearing at specified test points with standard multimeter.

RS 7 Set up and use a standard rf signal generator to supply test signals to radio receiver. Read the input level at which a prescribed receiver output is obtained.

RS 8 Set up and use a VTVM to measure voltages appearing at designated test points. Before connecting meter, shunt the connectors with a damping resistor of prescribed value.

RS 9 Turn on Radio Command equipment and observe prescribed warm-up time.

RS 10 Set up and use a standard VTVM to measure voltages at specified test points.

RS 11 Adjust control console front panel controls to specified knob readings or voltage output as read on a standard VTVM.

RS 12 Adjust potentiometer controls (screwdriver) for specified voltages as read on a standard VTVM.

Task RT Terminal Controller Operation Check -

Using an Unprogrammed Test Console

RT 1 Make electrical cable connections between test console and missile.

RT 2 Set up test console by throwing switches to prescribed initial positions; turn on main power and wait for prescribed warm up time; then check indicator lights for specified initial condition.

RT 3 Check operation of missile component by throwing switches on test console in proper sequence and reading built-in meters and indicator lamps. Check readings or indications with those specified on check list.

RT 4 Set up and use a standard VTVM to measure voltages at designated test points.

RT 5 Use a stop watch to time the period of application of control function (throwing switch).

REGULUS

Task RU Trounce Guidance Operational Check -

Using an Unprogrammed Test Console

RU 1 Make electrical and rf cable connections between test console and missile components. Turn on equipment and observe specified warm-up time.

RU 2 Set up and use a standard rf signal generator and a crystal current meter to check the sensitivity of a radar receiver. A dummy antenna load must be connected prior to this test.

RU 3 Compute receiver sensitivity from dial readings and cable parameters using simple arithmetic computations.

RU 4 Set up and use a standard rf power meter to determine the power output of a radar transmitter.

RU 5 Set up a test console by throwing switches to prescribed initial positions; turn on main power and observe warm-up time.

RU 6 Check operation of missile component by observing indicator lights on test console while push buttons or switches on missile control console are manipulated.

RU 7 Set up and use a standard ac VTVM to check voltages appearing at designated test points.

RU 8 Set critical voltages by making screwdriver adjustments to a potentiometer until desired voltage values are read on a VTVM.

RU 9 Set up and use a standard rf frequency meter to tune a radar receiver to prescribed frequency.

RU 10 Set up and use a standard rf frequency meter to tune a radar transmitter to prescribed frequency.

RU 11 Set up and use a secondary standard frequency meter to calibrate a standard rf frequency meter.

RU 12 Tune radar receiver by making adjustments in specified sequence to the LO injection probe, the receiver tuning dial, and the LO bias potentiometer (screwdriver) for prescribed readings on a crystal current meter and for maximum or minimum sound in headphones.

RU 13 Tune a radar transmitter by adjusting tuning control for prescribed frequency as read on a standard frequency meter.

RU 14 Adjust the coupling probe on a radar transmitter for maximum reading on a standard rf power meter.

Task RV Trounce Beacon-Decoder Operational Check

Using an Unprogrammed Test Set

RV 1 Connect electrical and rf cables between test set control box and missile components. Terminate antenna connections with proper dummy loads. Turn on power and observe prescribed warm-up time.

RV 2 Execute missile commands by depressing push buttons on control and check system operation by observing indicator lamps on test set.

Task RW Auto-Pilot Operational Check

Unprogrammed, No Console

NOTE: Incomplete since catalog refers for certain task descriptions to Sperry Handbooks.

RW 1 Make electrical cable connections between test bench and missile components. Mount gyro on special tilt table. Turn power ON and observe prescribed warm-up time.

RW 2 Level gyro by turning control knobs on tilt table, zero meters with trim knobs, and throw switches to specified initial positions.

RW 3 Tilt gyro to specified angles by operating tilt table control knobs and read control surface meters and measure voltages at specified test points.

RW 4 Set up and use a standard VTVM for measuring voltages at specified test points.

RW 5 Use a stop watch to measure the turning rate of a control synchro.

RW 6 Check wiring continuity of missile components with standard ohmmeter using terminal strips and cable connectors as test points.

RW 7 Read wiring and/or schematic diagrams to determine location of test points within missile components.

RW 8 Set up and use a special altitude simulator to check auto-pilot response to changes in missile altitude.

RW 9 Actuate relays by applying a dc voltage to specified terminals and connector strips.

RW 10 Measure missile altitude control by adjusting the altitude simulator control and rotating the auto-pilot pitch gyro for null reading on a VTVM. For each gyro setting read the corresponding voltage at a specified test point using a standard multimeter.

RW 11 Plot recorded test data on standard coordinate paper, construct and measure the slopes of curves.

RW 12 Start a stop watch as a switch is thrown and move tilt table to vertical position. Measure time required for missile control surface meters to come to zero.

RW 13 Compute rate of missile "nose-over" from recorded test data using simple arithmetic computations.

RW 14 Set up and use a special servo analyzer to make frequency response checks of an auto-pilot.

RW 15 Set up and use a standard oscilloscope to make frequency response checks of an auto-pilot.

RW 16 Use a standard voltmeter to voltage calibrate an oscilloscope.

RW 17 Make a frequency response check of an auto-pilot using a servo analyzer to generate the input signal which is varied in frequency and attenuated to keep the output signal constant in magnitude. The magnitude of the output signal is measured with an oscilloscope and the phase shift with the analyzer phase meter.

RW 18 Disconnect auto-pilot gyros and substitute spare gyros mounted on tilt tables.

RW 19 Install control surface protractors using specified procedure.

RW 20 Tilt gyros to specified angles by changing control knobs and read deflection of control surfaces on protractors.

RW 21 Plot test data on rectangular coordinate paper and construct and find slopes of curves.

RW 22 Adjust control surface dither signal amplitude by making screwdriver adjustments of potentiometer until proper amount of dither can be felt when control surfaces are touched.

REGULUS

Task RX Auto-pilot and Radio Command System

Operational Check - Using an Unprogrammed Test Console

RX 1 Connect electric cables between test console and missile. Turn on radio command equipment and the auto-pilot and observe prescribed warm-up times.

RX 2 Throw switches on test console to initial positions, zero meters with manual knobs and check indicator lamps for proper initial indications.

RX 3 Read and record built-in meters as radio command transmitter operator executes command functions.

RX 4 Check the missile hydraulic systems by reading bourdon gages and compare readings with pressures specified.

RX 5 Observe movement of engine throttle as throttle commands are executed at the Radio Command transmitter.

RX 6 Use a stop watch to measure the time required for control surfaces to move to specified positions and gyros to process as commands are executed at the Radio Command transmitter.

RX 7 Observe the action of wheel brake discs as commands are executed at the Radio Command transmitter.

RX 8 Listen for solenoid switch, valve action or delay timer motor noise as commands are executed at the Radio Command transmitter.

RX 9 Measure voltages at specified test points with a multimeter as commands are executed at the Radio Command transmitter.

Task RAE Voltage Regulator Unit
sub
(Bi-Polar Monitor Station) Maintenance Check

RAE sub 1 Connect electrical cables between missile components and power source.

RAE sub 2 Set up and use VTVM to measure voltages at specified test points.

REGULUS

Task RBE Receiver-Mixer
sub
(Bi-Polar Monitor Station) Maintenance Check

RBE sub 1 Use built-in meters to measure current and voltage.

RBE sub 2 Perform screwdriver adjustment of klystron local oscillator tuning while observing crystal current meter.

RBE sub 3 Set up and use a standard microwave signal generator.

RBE sub 4 Set up and use a special dual channel video pulse generator for triggering pulse signal generator.

RBE sub 5 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RBE sub 6 Set up and use a synchroscope to measure receiver signal to noise ratio.

RBE sub 7 Adjust an amplifier gain by adjusting a bias voltage potentiometer (screwdriver) so that specified output voltage is obtained with specified input. Determine if the bias, as measured on a built-in meter, is within specified limits.

RBE sub 8 Tune a reflex klystron local oscillator by performing potentiometer adjustment of repeller voltages and micrometer adjustment of cavity while observing mixer current on built-in meter, and receiver pulse output on synchroscope.

Task RCE Decoder-Director
sub
(Bi-Polar Monitor Station) Maintenance Check

RCE sub 1 Set up and use a standard microwave signal generator.

RCE sub 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RCE sub 3 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RCE sub 4 Set up and use a synchroscope to monitor pulses and to measure pulse amplitude.

RCE sub 5 Set up and use built-in VTVM to measure voltages.

RCE sub 6 Set up and use a synchroscope to monitor coincidence of two pulse groups. Adjust delay by turning knob until coincidence occurs.

RCE sub 7 Adjust potentiometers (screwdriver) so that waveforms viewed on a synchroscope have desired peak to peak amplitude, and slope.

Task RDE Encoder sub

(Bi-Polar Monitor Station) Maintenance Check

RDE sub 1 Set up and use a standard microwave signal generator.

RDE sub 2 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RDE sub 3 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RDE sub 4 Set up and use a synchroscope to monitor and measure pulse amplitude, repetition rate, width and spacing.

Task REE Loss of Signal Indicator Unit sub

(Bi-Polar Monitor Station) Maintenance Check

REE sub 1 Set up and use a standard microwave signal generator.

REE sub 2 Set up and use a special dual channel video pulse generator for triggering pulse signal generator.

REE sub 3 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

REE sub 4 Make electrical and microwave cable connections and set switches according to specified procedure to feed coded pulse signals to circuit inputs. Observe indications of signal lights.

Task RFE Modulator-Transmitter
sub

(Bi-Polar Monitor Station) Maintenance Check

See RIE 1 through RIE 11
sub sub

Task RGE Power Supply
sub

(Bi-Polar Monitor Station) Maintenance Check

See RLE 1 through RLE 11
sub sub

Task RHE Delay Units
sub

(Bi-Polar Monitor Station) Maintenance Check

See RIE 1 through RLE 12
sub sub

Task RIE Radar Beam Transmitter
sub

(Bi-Polar Beacon) Output Maintenance Check

RIE sub 1 Set up a microwave transmitter for output tests by using an rf test load, special detector, and external trigger source.

RIE sub 2 Set up and use a special dual channel video pulse generator as a trigger pulse source.

RIE sub 3 Set up and use a synchroscope to monitor microwave pulses and measure pulse width, amplitude, and spacing.

RIE sub 4 Compute output voltage be performing simple algebraic operations including logarithms.

RIE sub 5 Calibrate a heterodyne frequency meter by zero-beating its output against an internal crystal oscillator signal.

RIE sub 6 Calibrate the absorption-type frequency meter in a microwave spectrum analyzer (klystron oscillator) against external frequency standard.

RIE sub 7 Set up and use a microwave spectrum analyzer to measure magnetron frequency.

RIE sub 8 Observe magnetron output frequency on a microwave spectrum analyzer and if required perform screwdriver adjustment of tuning control.

RIE sub 9 Set up and use an rf power meter to measure average transmitter power output.

RIE sub 10 Use charts or nomographs to transform test data.

RIE sub 11 Compute peak power by performing simple algebraic operations including logarithmic manipulations and use of duty cycle concept.

Task RJE sub Radar Beam Receiver

(Bi-Polar Beacon) Maintenance Check

RJE sub 1 Use a standard voltmeter to measure voltages appearing at test points.

RJE sub 2 Use a built-in meter to measure current.

RJE sub 3 Adjust local oscillator coupling by turning knob so that desired crystal current as read on built-in meter is obtained.

RJE sub 4 Adjust an amplifier gain by adjusting a bias voltage potentiometer (screwdriver) so that specified output voltage is obtained with specified input. Determine if bias, as measured on built-in meter, is within specified limits.

RJE sub 5 Determine oscilloscope probe multiplying factor, using internal calibrating voltage.

RJE sub 6 Set up and use a standard microwave signal generator.

RJE 7 sub — Set up and use a special dual channel video pulse generator as a trigger pulse source.

RJE 8 sub — Set up and use a synchroscope to monitor and measure pulse width and amplitude.

RJE 9 sub — Tune a reflex klystron local oscillator by performing potentiometer adjustment of repeller voltage and micrometer adjustment of cavity. Observe mixer current on built-in meter, and receiver pulse output on synchroscope.

RJE 10 sub — Tune a resonant cavity by adjusting (screwdriver) tuning slug while observing a synchroscope.

Task RKE sub — Radar Beam Timer-Encoder

(Bi-Polar Beacon) Maintenance Check

RKE 1 sub — Determine oscilloscope probe multiplying factor, using internal calibrating voltage.

RKE 2 sub — Set up and use a special dual channel video pulse generator as a trigger pulse source.

RKE 3 sub — Set up and use an audio generator as an accurately calibrated horizontal sweep voltage for synchroscope.

RKE 4 sub — Set up and use a synchroscope to measure pulse amplitude, width, rise time and spacing.

RKE 5 sub — Set up and use a synchroscope to determine low frequency PRF by using an externally calibrated sweep and observing the number of pulses.

Task RLE sub — Radar Beam Power Supply

(Bi-Polar Beacon) Maintenance Check

RLE 1 sub — Connect missile components to 110 v line; visually check switch positions, fuze installation, and tube filament operation. Use auto-transformer to correct line voltage as read on built-in meter.

RLE sub 2 Connect a power decate resistance box to power supply output and adjust for specified current as read on a standard milliameter. Adjust the power supply voltage adjustment control (screwdriver potentiometer) and determine range of adjustment possible as read on standard VTVM.

RLE sub 3 Set up and use a VTVM for dc voltage measurement.

RLE sub 4 Use a power resistance decade box as a load, a series connection of batteries as a bucking voltage, a VTVM, a milliameter, and a variac to make power supply regulation measurements.

RLE sub 5 Compute power supply regulation and output resistance from test data using simple algebraic formulae.

RLE sub 6 Measure minimum dc relay activating voltage, using standard VTVM. This is accomplished by increasing supply voltage until relay is observed to close. If necessary adjust screw on relay armature.

RLE sub 7 Measure power supply output voltage at specified load, as input voltage is changed with autotransformer. Calculate per cent change of output voltage.

RLE sub 8 Measure a power supply output voltage as a function of load resistance (decade box) variation.

RLE sub 9 Measure power supply ripple voltage with a VTVM.

RLE sub 10 Set up and use an oscilloscope to monitor power supply ripple voltage.

RLE 11 Perform screwdriver adjustments of the voltage of which a relay operates.

Task RME sub Radar Beam Delay Unit

(Bi-Polar Beacon) Maintenance Check

RME sub 1 Voltage calibrate a synchroscope using an internal calibrating circuit.

RME sub 2 Determine an oscilloscope probe multiplying factor, using an internal calibrating voltage.

RME sub 3 Set up and use a synchroscope to monitor pulse waveforms.

RME sub 4 Calibrate a special marker generator by adjusting potentiometers until markers and pulses appearing on a synchroscope have desired spacing and position.

RME sub 5 Use a synchroscope to compare the frequency of two non-sinusoidal signals by applying one to the signal input terminals and other to the external "sync" terminals and observing if stable pattern is obtained.

RME sub 6 Adjust the time delay of a pulse by manually rotating mechanical counter coupled to a synchro generator until the pulse is lined up with a desired marker, as displayed on a synchroscope. Determine if the counter reading corresponds to the specified pulse delay in miles.

RME sub 7 Use a laboratory standard voltmeter (1% accuracy) to measure power supply output.

RME sub 8 Adjust regulated power supply outputs with potentiometer (screwdriver).

RME sub 9 Adjust a thermostat operation for a desired temperature range.

RME sub 10 Set helipot limit switch operating point by loosening a mechanical coupling. Manually rotate gear train; adjust and lock the position of a veeder-root counter and a helipot.

RME sub 11 Adjust the pulse position and tracking relative to marker "comb," as monitored on a synchroscope, by adjusting potentiometers and gear trains, while reading veeder-root counters. Use specified external "sync" on scope.

RME sub 12 Rotate component resolves to adjust pulse position relative to a marker "comb" on synchroscope. Use specified external "sync" on scope.

Task RME sub Radar Beam Release Unit

(Bi-Polar Beacon) Maintenance Check

RNE sub 1 Slew a servo-motor gear train system by operating a switch until a veeder-root counter reads a desired value.

RNE sub 2 Put "range" into a servo system by rotating a control transformer stator barrel (knob) according to specified procedure.

RNE sub 3 Turn a veeder-root counter knob, until a light is energized; then read counter.

RNE sub 4 Remove a relay cover and force relay contacts into desired position. After performing prescribed operations observe relay contact position and if necessary perform potentiometer adjustment.

RNE sub 5 Loosen clamping screws which position an autosyn stator barrel. Turn the stator barrel until minimum output voltage, as measured at test point with a standard VTVM, is obtained.

RNE sub 6 Turn a veeder-root counter knob until maximum voltage reading is obtained on a standard VTVM.

RNE sub 7 Use manual knob to set servo gear train into motion and visually check counter to determine whether servo amplifier follows without oscillation.

RNE sub 8 Set up and use a VTVM to measure the voltage available at test point.

RNE sub 9 Remove a relay cover and insulate the staticnary contact from the movable contact with pieces of cardboard.

RNE sub 10 Manipulate a potentiometer to determine whether output voltage, as measured at test point with a standard VTVM, is a minimum.

Task ROE sub Radar Beam Range Tracker

(Bi-Polar Beacon) Maintenance Check

ROE sub 1 Check and if necessary adjust a servo amplifier balance by setting input potentiometer to a minimum, manipulating balance potentiometer and observing a standard VTVM to determine whether the output is zero or minimum.

ROE sub 2 Check and if necessary adjust a dc amplifier balance by disconnecting an input signal, manipulating a balance potentiometer, and observing a standard VTVM to determine whether the output is zero, or minimum.

ROE sub 3 Remove a relay cover and determine the position of contacts.

ROE sub 4 Adjust servo system gear trains by turning a knob until two veeder-root counter readings are similar.

ROE sub 5 Set up and use a synchroscope to monitor pulse waveshape from the Range Tracker. If necessary adjust a potentiometer to obtain desired waveshape.

ROE sub 6 Set up and use VTVM to measure output voltage available at test point.

ROE sub 7 Set up and use a synchroscope in conjunction with a pedestal generator to determine if a tracking pulse remains within pedestal limits, and at same time inspect a relay for correct contact position.

ROE sub 8 Set up and use a VTVM to measure the voltage available at test point.

ROE sub 9 Calculate the velocity error of a tracking unit by synchronizing and locking servo gear trains, manually adjusting gear train counter readings, reading voltages, and performing a prescribed procedure including simple arithmetic operations.

ROE sub 10 Set a slewing switch and observe if gear trains move smoothly and without jumping.

SPARROW

Task SA Control System Operational Check -

Using an Unprogrammed Test Console

SA 1 Mount the missile control and power assemblies in the missile test stand.

SA 2 Make necessary microwave, electric cable, hydraulic hose, and air hose connections between the missile components and test consoles.

SA 3 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SA 4 Tune a klystron oscillator to a stable mode of oscillation at a prescribed frequency.

SA 4a Read a micrometer vernier dial.

SA 4b Use a coaxial frequency meter, a wattmeter bridge, and bias supply meters to determine correct adjustments for tuning a klystron oscillator.

SA 4c Switch the output of a built-in pulse generator to a klystron oscillator. Adjust pulse amplitude for proper per cent modulation as read from built-in meter. Re-adjust klystron frequency with fine frequency control.

SA 4d Use charts or nomographs to transform test data.

SA 5 Set up and use a standard synchro-oscilloscope for monitoring microwave pulses.

SA 6 Adjust a special pulse generator for output pulses of required level, magnitude, stability, and shape. Adjustments involve potentiometer control knobs which are set for prescribed meter readings and correct output wave shapes.

SA 7 Tune a conventional microwave stub transformer to maintain an impedance match between a microwave generator and a transmission line. The adjustment is determined by reading a built-in microwave power meter.

SA 8 Adjust standard microwave power attenuators by setting control knobs to prescribed positions read from graph.

SA 9 Adjust wing dither signal amplitude by making screwdriver adjustments on a potentiometer until the proper amount of wing vibration is felt by hand.

SA 10 Visually inspect all test equipment controls for the correct initial starting position. More than one hundred controls are checked.

SA 11 Adjust control system gain by making screwdriver adjustments on gain potentiometers until the proper wing deflections are noted.

SA 12 Read a voltage from a wing position potentiometer and translate to degrees of wing deflection by use of a multiplying factor which is given to three significant figures.

SA 13 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SA 14 Compute system response parameters from recorded test data. The computations involve simple algebraic or arithmetic manipulation.

SA 15 Shut down test equipment. Hydraulic, air and electrical power must be terminated in proper sequence and all lines and cabling between test consoles and missiles removed.

SA 16 Set up and use a multi-channel recording oscillograph to record wing positions during control system test. Each channel must be calibrated (using internal calibration circuit) and all pens zeroed prior to time of test.

Task SB Control System Maintenance Check

SB 1 Mount the missile control and power assemblies in the missile test stand.

SB 2 Make necessary microwave, electric cable, hydraulic hose, and air hose connections between the missile components and test consoles.

SB 3 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SB 4 Visually inspect all test equipment controls for the correct initial starting position. More than one hundred controls are checked.

SB 5 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps, or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SB 6 Set up and use a multi-channel recording oscillograph to record wing positions during control system test. Each channel must be calibrated (using internal calibration circuit) and all pens zeroed prior to time of test.

SB 7 Set up and use a standard VTVM for ac voltage measurements.

SB 8 Compute system response paramcters from recorded test data. The computations involve simple algebraic or arithmetic manipulation.

SB 9 Determine phase relationship between two signals.

SB 9a Set up and use a standard oscilloscope.

SB 9b Set up and use a standard audio oscillator as a test signal source.

SB 9c Interprct Lissajous figures as received on oscilloscope screen, in terms of phase angle between two signals.

SB 10 Use a multi-channel recording oscillograph to monitor continuous signals. Compute system gain and phase angle between two signals from measurements on test records. In computing gain, frequency response of test equipment components must be accounted for. The computations involve simple algebraic or arithmetic manipulation.

SB 11 Recage a free gyro by manipulation of mechanical controls according to specified procedures.

SB 12 Tune a klystron oscillator to a stable mode of oscillation at a prescribed frequency.

SB 12a Read a micrometer vernier dial.

SB 12b Use a coaxial frequency meter, a wattmeter bridge, and bias supply meters to determinc correct adjustments for tuning a klystron osicllator.

SB 12c Switch the output of a built-in pulse generator to a klystron oscillator. Adjust pulse amplitude for proper per cent modulation as read from built-in meter. Re-adjust klystron frequency with fine frequency control.

SB 12d Use charts or nomographs to transform test data.

SB 13 Set up and use a standard synchro-oscilloscope for monitoring microwave pulses.

SB 14 Adjust a special pulse generator for output pulses of required magnitude, stability, and shape. Adjustments involve potentiometer control knobs which are set for prescribed meter readings and correct output wave shapes.

SB 15 Tune a conventional microwave stub transformer to maintain an impedance match between a microwave generator and a transmission line. The adjustment is determined by reading a built-in microwave power meter.

SB 16 Adjust standard microwave power attenuators by setting control knobs to prescribed positions read from graph.

SB 17 Set up and use a standard oscillo-synchroscope for pulse monitoring. Accurately sketch pulse shapes. Compute pulse shape parameters by measuring pulse, height and width. Simple arithmetic and algebraic manipulations are involved.

SB 18 Adjust control system gain by making screwdriver adjustments on gain potentiometers until the proper wing deflections are noted.

SB 19 Shut down test equipment. Hydraulic, air and electrical power must be terminated in proper sequence and all lines and cabling between test consoles and missiles removed.

Task SC Battery Operational Check

SC 1 Use a standard multimeter for checking circuit continuity and/or circuit resistance values. Record values and compare with normal values specified.

SC 2 Make necessary electric cable connections between the missile component and test set.

SC 3 Connect missile component to special battery box test set. Clamp chassis in holder and make electric cable connections. Set up and warm up test set by throwing switches, adjusting potentiometer control knobs, and making jumper connections in prescribed sequence.

SC 4 Test missile component by manipulating test controls according to a specified procedure and observe indicating lamps for normal or abnormal indications.

Task SD Guidance Receiver Maintenance Check

SD 1 Make necessary electric cable connections between the missile component and the test consoles.

SD 2 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SD 3 Set up and use a standard synchro-oscilloscope for monitoring microwave pulses.

SD 4 Adjust a special pulse generator for output pulses of required level, magnitude, stability, and shape. Adjustments involve potentiometer control knobs which are set for prescribed meter readings and correct output wave shapes.

SD 5 Set up and use a standard VTVM for ac voltage measurements.

SD 6 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing position. Meter readings and lamp indications are recorded and compared with specified normal values.

SD 7 Set up and use a standard oscillo-synchroscope for pulse monitoring. Accurately sketch pulse shapes. Compute pulse shape parameters by measuring pulse, height, and width. Simple arithmetic and algebraic manipulations are involved.

SD 8 Set up and use an oscillo-synchroscope for measuring voltages of microwave pulses. Calibrate scope for voltage, using an internal calibrating circuit.

SD 9 Read wiring and schematic diagrams to locate test points to which standard test instruments shall be connected.

Task SE Guidance Amplifier Unit Maintenance Check

SE 1 Make necessary electric cable connections between the missile component and the test consoles.

SE 2 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SE 3 Set up and use a standard oscilloscope for monitoring continuous wave signals.

SE 4 Set up and use a standard EPUT meter for measuring signal frequency.

SE 5 Determine phase relationship between two signals.

SE 5a Set up and use a standard oscilloscope.

SE 5b Interpret Lissajous figures as received on oscilloscope screen, in terms of phase angle between two signals.

SE 6 Set up and use a standard VTVM for measuring voltages at specified test points.

SE 7 Set up and use standard multimeter for making voltage measurements.

SE 8 Set up and use a standard audio oscillator as a test signal source.

SE 9 Set up and use a multi-channel pen recorder to record report and output signals. Calibrate each channel using internal calibrating circuits, and zero all pens used.

SE 9a Use a multi-channel recording oscillograph to monitor continuous signals. Compute system gain and phase angle between two signals from measurements on test records. In computing gain, frequency response of test equipment components must be accounted for.

SE 9b Compute system response parameters from recorded test data. The computations involve simple algebraic or arithmetic manipulation, including use of logarithms.

SE 10 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SE 11 Adjust amplifier gain by making screwdriver adjustments on gain potentiometers until output signal amplitude as read on VTVM is consistant with specified gain.

SE 12 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method to adjust oscillator output amplitude and to balance modulator and amplifier.

SE 13 Set up and use a standard capacitance decade box for determining required circuit capacitance by the substitution method to adjust oscillator frequency and to balance modulator and amplifier.

SE 14 Remove and replace resistors and capacitors in missile components using hand tools (soldering iron, etc).

SE 15 Balance push-pull audio or dc amplifiers by making adjustments to resistance and capacitance decade boxes for specified readings on a VTVM connected to test points. Adjustments must be made in sequence according to specified procedure.

SE 16 Read wiring and schematic diagrams to locate test points to which standard test instruments shall be connected.

SE 17 Adjust oscillator frequency by adjusting capacitor decade box until desired frequency is indicated by EPUT meter.

SE 18 Adjust oscillator output voltage by adjusting a resistance decade box until specified voltage is read on a VTVM connected to test points.

SE 19 Adjust the cut-off frequency of a low pass filter by adjusting a pair of decade capacitances for specified voltages as read on a VTVM connected to test points.

SE 20 Correct an audio amplifier for phase shift by adjusting a decade capacitance for a specified Lissajous pattern as viewed on an oscilloscope.

Task SF Summing Amplifier Unit Maintenance Check

SF 1 Make necessary electric cable connections between the missile component and the test consoles.

SF 2 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SF 3 Set up and use a standard multimeter for making voltage measurements.

SF 4 Use a standard multimeter for checking circuit continuity and/or circuit resistance valves. Record values and compare with normal values specified.

SF 5 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SF 6 Set up and use a standard VTVM for ac voltage measurements.

SF 7 Determine phase relationship between two signals.

SF 7a Set up and use a standard oscilloscope.

SF 7b Interpret Lissajous figures as received on oscilloscope screen, in terms of phase angle between two signals.

SF 8 Set up and use a standard oscilloscope for monitoring continuous wave signals.

SF 9 Read wiring and schematic diagrams to locate test points to which standard test instruments shall be connected.

SF 10 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method for adjusting amplifier gain and limiter limits.

SF 11 Remove and replace resistors and capacitors in missile components using hand tools (soldering iron, etc.).

SF 12 Adjust the gain of an audio amplifier by making adjustments to a resistance decade box for a specified voltage as read on a VTVM, connected to test points. Adjustments must be made in sequence according to a specified procedure.

Task SG Servo Amplifier Unit Maintenance Check

SG 1 Make necessary electric cable connections between the missile component and the test consoles.

SG 2 Set up and use a standard EPUT for measuring signal frequency.

SG 3 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SG 4 Set up and use a standard VTVM for ac voltage measurements.

SG 5 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SG 6 Remove and replace resistors and capacitors in missile components using hand tools (soldering iron, etc.).

SG 7 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method in order to adjust the dynamic gains balance of amplifier and to correct static balance of amplifier.

SG 8 Balance and adjust the gain of a push-pull dc amplifier by making adjustments to a pair of resistance decade boxes. Adjustments are made in sequence according to a specified procedure for specified voltages as read from a VTVM connected to test points.

Task SH Free Gyro Unit Maintenance Check

SH 1 Make necessary electric cable connections between the missile component and the test consoles.

SH 2 Mount free gyro unit on a special test table using appropriate mounting adaptors and level the table before test.

SH 3 Set up and use a sine-drive table for vibration of a gyro unit during maintenance check.

SH 4 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SH 5 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SH 6 Set up and use a multi-channel pen recorder to record output signals. Calibrate each channel using internal calibrating circuits, and zero all pens used.

SH 7 Read wiring and schematic diagrams to locate test points to which standard test instruments shall be connected.

SH 8 Recage a free gyro by manipulating wheels and levers according to specified procedures.

Task SI Rate Gyro Unit Maintenance Check

SI 1 Make necessary electric cable connections between the missile component and the test consoles.

SI 2 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SI 3 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SI 4 Mount rate gyro unit in special pendulum test fixture and use pendulum according to prescribed procedure for acceleration testing of unit.

SI 5 Set up and use a multi-channel pen recorder to record output signals. Calibrate each channel using internal calibrating circuits, and zero all pens used.

SI 6 Remove and replace resistors and capacitors in missile components using hand tools (soldering iron, etc.).

SI 7 Adjust a rate gyro for sensitivity and dynamic balance. The adjustment involves screwdriver adjustments of magnetic circuit air gaps using a pen recorder as indicating instrument. The gyro is accelerated by a Pendulum Test Fixture.

SI 8 Tune the rotor winding of a gyro pick-off synchro by adjusting a capacitance decade box for a specified voltage as read on a built-in voltmeter.

Task SJ Rectifier Unit Maintenance Check

SJ 1 Make necessary electric cable connections between the missile component and the test consoles.

SJ 2 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator settings.

SJ 3 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SJ 4 Set up and use a multi-channel pen recorder to record output signals. Calibrate each channel using internal calibrating circuits, and zero all pens used.

SJ 5 Set up and use a standard VTVM for ac voltage measurements.

SJ 6 Replace fixed resistors and/or adjust variable potentiometer (screwdriver) to adjust output voltages of a rectifier power supply according to a prescribed procedure.

SJ 7 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method in order to adjust a regulated power supply output.

SJ 8 Remove and replace resistors and capacitors in missile components using hand tools (soldering iron, etc.).

SJ 9 Set up and use a standard Kelvin Bridge ohmmeter for making precise resistance measurements.

SJ 10 Read wiring and schematic diagrams to locate test points to which standard test instruments shall be connected.

SJ 11 Use a standard multimeter for checking circuit continuity and/or circuit resistance values. Record values and compare with normal values specified.

SJ 12 Shut down test equipment. Hydraulic, air and electrical power must be terminated in proper sequence and all lines and cabling between test consoles and missiles removed.

SJ 13 Adjust the output voltage of a power supply by adjusting a resistance decade box for a specified voltage reading on a built-in meter.

Task SK Junction Box Maintenance Check

SK 1 Use a standard multimeter for checking circuit continuity and/or circuit resistance values. Record values and compare with normal values specified.

SK 2 Connect high potential voltage leads from test panel between cable connector pins and ground in order to apply a dielectric breakdown test voltage to missile cables. An indication of current flow as read on a built-in meter indicates failure of insulation.

SK 3 Read wiring and schematic diagrams to locate test points to which standard test instruments shall be connected.

Task SL Harness Maintenance Check (Control Section)

SL 1 Use a standard multimeter for checking circuit continuity and/or circuit resistance values. Record values and compare with normal values specified.

SL 2 Connect high potential voltage leads from test panel between cable connector pins and ground in order to apply a dielectric breakdown test voltage to missile cables. An indication of current flow as read on a built-in meter indicates failure of insulation.

SL 3 Read wiring and schematic diagrams to locate test points to which standard instruments shall be connected.

SPARROW

Task SM Servo Valve and Hydraulic Maintenance Check

(Hub Section)

SM 1 Mount missile component in special test stand; make hydraulic line and electric cable connections; and install special pipe plugs in specified hydraulic fittings.

SM 2 Use a standard dial indicator (center gage) to center wing hubs within specified tolerances.

SM 3 Set controls and warm up test consoles. Throw switches to initial positions adjust potentiometer control knobs to specified dial or indicator setting.

SM 4 Manually relatch a spring loaded mechanism by manipulating a special rod through a hole provided for the purpose.

SM 5 Use a standard fish scale to measure spring tension in order to check the adjustment of an arming mechanism.

SM 6 Manipulate test console controls to test missile component according to a specified procedure and observe oscilloscope to determine necessary adjustments.

SM 7 Set up and use a standard oscilloscope for monitoring continuous wave signals.

SM 8 Make adjustments to clearance gaps and motion limits of precision mechanisms using standard screwdrivers, wrenches, feeler gages, calipers and height gages.

SM 9 Remove and replace springs and other small parts of precision mechanisms using standard hand tools and special fixtures.

SM 10 Manually center hydraulic actuators and adjust a trim potentiometer for zero reading on a VTVM to zero a servo system. Lock (lock-nut) the potentiometer in this position.

SM 11 Adjust a torsion spring for the proper time rate of motion of an actuating arm. Load the arm with test dead weights, actuate a release trigger and time arm movement with a standard stop watch. Adjust spring until time coincided with that specified on a chart.

Task SN Battery Unit Maintenance Check

SN 1 Make necessary electric cable connections between the missile component and the test consoles.

SN 2 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SN 3 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SN 4 Set up and use a standard VTVM for ac voltage measurements.

SN 5 Set up and use a standard Kelvin Bridge ohmmeter for making precise resistance measurements.

SN 6 Adjust output voltage and ripple voltage to specified values by adjusting potentiometers (screwdriver) or tapped resistors for correct output meter readings.

SN 7 Test missile component by manipulating test controls according to a specified procedure and observe indicating lamps for normal or abnormal indications.

SN 8 Connect high potential voltage leads from test panel to cable connector pins and ground in order to apply a dielectric breakdown test voltage to missile cables. An indication of current flow as read on a built-in meter indicates failure of insulation. Potential is impressed across test points through internal switching which is done according to a specified procedure.

Task SO Antenna, Detector, and Preamplifier

Maintenance Check (Tail Section)

SO 1 Mount the missile tail section in a special test stand and connect output waveguides of the rf console to the missile antennae.

SO 2 Make necessary electric cable connections between the missile component and the test consoles.

SO 3 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SO 4 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SO 5 Tune a klystron oscillator to a stable mode of oscillation at a prescribed frequency.

SO 5a Read a micrometer vernier dial.

SO 5b Use a coaxial frequency meter, a wattmeter bridge, and bias supply meters to determine correct adjustments for tuning a klystron oscillator.

SO 5c Switch the output of a built-in pulse generator to a klystron oscillator. Adjust pulse amplitude for proper per cent modulation as read from a built-in meter. Readjust klystron frequency with fine frequency control.

SO 5d Use charts or nomographs to transform test data.

SO 6 Set up and use a standard synchro-oscilloscope for monitoring microwave pulses.

SO 7 Adjust a special pulse generator for output pulses of required level, magnitude, stability, and shape. Adjustments involve potentiometer control knobs which are set for prescribed meter readings and correct output wave shapes.

SO 8 Tune a conventional microwave stub transformer to maintain an impedance match between a microwave generator and a transmission line. The adjustment is determined by reading a built-in microwave power meter.

SO 9 Adjust standard microwave power attenuators by setting control knobs to prescribed positions read from a graph.

SO 10 Use a standard microwave for checking circuit continuity and/or circuit resistance values. Record values and compare with normal values specified.

SO 11 Set up and use an oscillo-synchroscope for measuring voltages of microwave pulses. Calibrate scope for voltage, using an internal calibrating circuit.

SO 12 Read wiring and schematic diagrams to locate test points to which standard test instruments shall be connected.

Task SP Arming and Firing Circuits

Maintenance Check

SP 1 Make necessary electric cable connections between missile and test console.

SP 2 Set controls and warm up test consoles. Throw switches to initial positions.

SP 3 Depress push buttons in specified sequence and read meters, timers and indicator lamps for indications of circuit performance.

Task SAT Wattmeter Bridge Maintenance Check

SAT 1 Connect a Millivac meter to specified test points and read output voltage.

SAT 2 Adjust output voltage by making screwdriver adjustment to potentiometer. Set specified voltage as read on voltmeter to three significant figures.

SAT 3 Set up and use an ac VTVM for measuring ripple voltage of dc power supply.

SAT 4 Adjust line voltage, as read on an ac VTVM, to specified values by adjusting input Variac Control.

SAT 5 Read VTVM to check regulation of dc power supply output voltage as input voltage is varied.

SAT 6 Set up and use an audio oscillator and an oscilloscope to determine the frequency of an af test signal.

SAT 6a Interpret Lissajous figures in terms of frequency of test signal.

SAT 7 Calibrate a built-in VTVM using another VTVM and an audio oscillator according to specified procedure.

SAT 8 Tune Wein bridge oscillator by changing fixed tuning capacitors. When required values are found install permanently.

Task SBT Modulation Monitor Maintenance Check

SBT 1 Adjust an AGC voltage as read on a built-in meter, to specified value by making screwdriver adjustment to a potentiometer.

SBT 2 Set up and use a standard oscilloscope for viewing microwave pulses and measuring pulse amplitude.

SBT 3 Calibrate an oscilloscope for voltage measurement using an internal calibrating circuit.

SBT 4 Set up and adjust a standard pulse generator for output pulses of specified width, frequency and amplitude as viewed on an oscilloscope.

SBT 5 Adjust a blocking oscillator cathode bias (screwdriver adjustment of potentiometer) for clean reliable output pulses. The oscillator is driven with an external pulse generator and the output is viewed with an oscilloscope.

Task SCT Klystron Power Supply Maintenance Check

SCT 1 Measure a time delay interval with a standard stop watch after actuation of a time delay relay.

SCT 2 Set up and use an ac VTVM for measuring ripple voltage of dc power supply. Because of high D.C. level of output an auxiliary protective network shall be included between the power supply and the VTVM.

SCT 3 Set up and use a standard multimeter for measuring power supply output voltages.

Task SDT Radar Beam Simulator Maintenance Check

(Microwave Test Console)

SDT 1 Set up and use two oscilloscopes to compare the phase angle between two 50 cycle per second modulated rf signals.

SDT 2 Set up and use an oscilloscope to view a single modulated pulse and adjust the pulse modulator for specified per cent modulation.

SDT 2a Compute the per cent modulation of a modulated pulse by comparing modulated area to the unmodulated area of the pulse as viewed on an oscilloscope.

Task SET Video Control Console Maintenance Check

SET 1 Visually check relay action between specified voltage limits after energizing dc relays with a variable voltage source.

SET 2 Use an accurate chronograph to check the calibration of an elapsed time meter.

SET 3 Use a variable voltage source and a known accurate voltmeter to check, calibrate, and zero a voltmeter.

SET 4 Warm up and "zero" a vacuum tube voltmeter; calibrate each ac and dc voltage range with variable voltage sources and known accurate voltmeters.

SET 5 Use a multimeter to check the range of output voltage adjustment possible by varying a front panel control.

SET 6 Use a multimeter to check circuit resistance and wiring continuity.

SET 7 Check and adjust a regulated power supply.

SET 7a Adjust the output voltage of a regulated dc power supply by making a screwdriver adjustment on a potentiometer. The adjustment connot be made until a dummy load of the proper resistance is connected across the proper output terminal.

SET 7b Check the voltage regulation of a regulated dc power supply by varying first the load resistance and then the input voltage to the supply.

SET 7c Use an ac VTVM to check ripple voltage output of a regulated dc power supply. Observe that the maximum specified ripple output is not exceeded for conditions of maximum and minimum load current and maximum and minimum input voltage.

SET 8 Check and calibrate an audio amplifier.

SET 8a Set up and use an audio oscillator as a test signal source. Apply a signal of specified amplitude to an rf amplifier. Set up and connect a VTVM and an oscilloscope to the output terminals of the amplifier to monitor the output signal. Observe the output signal for amplitude and presence of distortion at maximum setting of amplifier gain potentiometer.

SET 8b Balance and calibrate an af push-pull amplifier by making screwdriver adjustments to potentiometers. Adjustments are made to obtain specified voltages at specified test points in the circuit using a VTVM as an indicating instrument.

Task SFT Video Test Console Maintenance Check

SFT 1 Use a variable voltage source and a known accurate voltmeter to check, calibrate, and zero a voltmeter.

SFT 2 Align a pulse generator according to specified procedure. A step-by-step procedure must be used and correct sequence of operations is very critical.

SFT 3 Set up and use a VTVM to check dc operating voltages of an electronic circuit and compare with specified values. Tolerance is ten per cent of specified voltages.

SFT 4 Adjust the output voltage of a regulated dc power supply by making a screwdriver adjustment on a potentiometer. The adjustment cannot be made until a dummy load of the proper resistance is connected across the proper output terminal.

SFT 5 Adjust a trimmer capacitor to tune an oscillator circuit for correct frequency of oscillation and check amplitude of output signal.

SFT 6 Set up and use an audio oscillator and an oscilloscope to determine the frequency of an af signal.

SFT 7 Set up and use an oscilloscope to check the operation of a counting circuit by comparing the number of pulses viewed at specified test points in the circuit.

SFT 8 Check the amplitude and width of microwav pulses using an oscilloscope and a VTVM.

SFT 9 Align a multivibrator circuit to obtain output pulses of specified width. Pulse width is varied by making potentiometer (screwdriver) adjustment while observing an oscilloscope.

SFT 10 Adjust the trimming capacitors of a pulse forming delay line to obtain specified output pulse shape as viewed on an oscilloscope. Adjustments are made to affect the rise time, overshoot, flatness of top, decay time, and the pulse width of the output pulses. The signal must be applied directly to the deflection plates of the oscilloscope so as not to obscure the high frequency components of the pulses.

SFT 11 Set up and calibrate an oscilloscope for frequency using an external frequency standard. Use the oscilloscope for checking pulse spacing sequence.

SFT 12 Change the taps on pulse forming delay lines to adjust the spacing of microwave pulses.

SFT 13 Balance the amplitude of pulses from pulse forming circuits by selecting vacuum tubes of similar characteristics. Select tubes by observing the output pulses on an oscilloscope after tube replacements.

SFT 14 Tune an af band pass filter by replacing filter capacitors to obtain a maximum output signal from the filter at a specified frequency. Measure signal output with a VTVM using a standard sine-wave generator as input signal source.

SFT 15 Align a two phase resolver by tuning the driver transformer with a trimming capacitor. Adjust a trimmer until the output signal carriers minimum noise as viewed on an oscilloscope.

SFT 16 Use a stop watch to time the delay interval of a relay. Set relay for proper delay interval by mechanically adjusting the delay control.

SFT 17 Check and adjust a regulated power supply.

SFT 17a Adjust the output voltage of a regulated dc power supply by making a screwdriver adjustment on a potentiometer. The adjustment cannot be made until a dummy load of the proper resistance is connected across the proper output terminal.

SFT 17b Check the voltage regulation of a regulated dc power supply by varying the load resistance and then the input voltage to the supply.

SFT 17c Use an ac VTVM to check ripple voltage output of a regulated dc power supply. Observe that the maximum specified ripple output is not exceeded for condition of maximum and minimum load current and maximum and minimum input voltage.

SFT 18 Check a calibrated voltage attenuator for circuit linearity. Apply microwave pulses to the input terminals and view the output pulses on an oscilloscope. Note any change in wave-slope, amplitude, or pulse rise time. Repeat test for each attenuator control position.

SFT 19 Calibrate an attenuator using a battery as input voltage source and a high impedance, accurate voltmeter as an output voltage indicator. Calculate the voltage attenuation for each set of readings and compare with control knob calibrations.

Task SGT Servo Test Console Maintenance Check

SGT 1 Use a multimeter to check circuit resistance and wiring continuity.

SGT 2 Use a variable voltage source and a known accurate voltmeter to check, calibrate, and zero a voltmeter.

SGT 3 Check and adjust a regulated power supply.

SGT 3a Adjust the output voltage of a regulated dc power supply by making screwdriver adjustments on a potentiometer. The adjustment cannot be made until a dummy load of the proper resistance is connected across the proper output terminal.

SGT 3b Check the voltage regulation of a regulated dc power supply by varying first the load resistance and then the input voltage to the supply.

SGT 3c Use an ac VTVM to check ripple voltage output of a regulated dc power supply. Observe that the maximum specified ripple output is not exceeded for conditions of maximum and minimum load current and maximum and minimum input voltage.

SGT 4 Calibrate a vacuum gage using a mercury monometer.

Task SHT Component Power Supply Test Console

Maintenance Check

SHT 1 Use a variable voltage source and a known accurate voltmeter to check, calibrate, and zero a voltmeter.

SHT 2 Use a multimeter to check circuit resistance and wiring continuity.

SHT 3 Use an accurate chronograph to check the calibration of an elapsed time meter.

SHT 4 Use a stop watch to time delay interval of a relay. Set relay for proper delay interval by mechanically adjusting the delay control.

SHT 5 Check and adjust a regulated power supply.

SHT 5a Adjust the output voltage of a regulated dc power supply by making a screwdriver adjustment on a potentiometer. The adjustment cannot be made until a dummy load of the proper resistance is connected across the proper output terminal.

SHT 5b Check the voltage regulation of a regulated dc power supply by varying the load resistance and then the input voltage to the supply.

SHT 5c Use an ac VTVM to check ripple voltage output of a regulated dc power supply. Observe that the maximum specified ripple output is not exceeded for conditions of maximum and minimum load current and maximum and minimum input voltage.

Task SIT Recorder Console Maintenance Check

SIT 1 Use a variable ac voltage as a signal source, and a VTVM to measure output signal for adjusting the gain of a dc amplifier.

SIT 2 Adjust the damping of a dc amplifier by varying a potentiometer control (screwdriver) to obtain specified conditions of signal attenuation with input signal frequency. Use an audio oscillator for the input signal source and an ac VTVM for the output signal indicator.

SIT 2a Use an audio oscillator and a VTVM to determine frequency response.

SIT 2b Use a potentiometer to adjust the gain of a dc amplifier at various frequencies.

SIT 3 Measure the phase angle between two af signals using an oscilloscope.

SIT 3a Interpret Lissajous figures as viewed on an oscilloscope in terms of the phase angle between two signals.

SIT 4 Set up and use a sensitive VTVM to check the ripple voltage output of a demodulator.

SIT 5 Balance a dc amplifier by adjusting balancing potentiometers (screwdriver). Adjustments are made to obtain specified voltages at specified test points in the circuit using a VTVM as an indicating instrument.

Task SJT Hydraulic Console Maintenance Check

SJT 1 Calibrate a bourdon pressure gage between limits of $\pm$ 1 atmosphere using a mercury manometer.

SJT 2 Manually adjust a pressure limit switch for specified activating pressure.

Task SKT Hydraulic Test Bench Maintenance Check

SKT 1 Balance a dc amplifier by making front panel knob adjustments for specified built-in meter readings.

SKT 2 Check amplifier gain using a calibrated test input signal and reading the amplifier output on built-in meters. Compute voltage again.

SKT 3 Balance a dc amplifier by substituting a standard resistance decade box for the fixed balancing resistor and adjust decade box for amplifier balance as indicated on built-in meter.

SKT 4 Remove and replace a standard resistor using hand tools.

SKT 5 Tune an audio oscillator to specified frequency by making screwdriver adjustment to a tuning capacitor until the correct frequency is indicated on a standard frequency meter.

SKT 6 Set up and use a VTVM for checking output level of af oscillators.

Task SLT Gyro Test Equipment Maintenance Check

SLT 1 Check and if necessary adjust the regulation of a dc regulated power supply using a variac, decade power resistance box, and built-in meters.

SLT 2 Adjust a potentiometer (screwdriver) until the output voltage of a regulated dc power supply remains within specified limits as the input voltage is varied with a variac and the load is changed with a power resistance decade box.

SLT 3 Measure the ripple voltage of a regulated dc power supply with a standard VTVM. Load the power supply to full rated load with a power decade resistance box before measurement is made.

SLT 4 Adjust the output voltages of a regulated dc power supply by adjusting potentiometers (screwdriver) until specified voltages are read on a known accurate voltmeter. Load the power supply to full rated load with a power decade resistance box before adjustment is made. Reference the built-in meters at specified voltages.

SLT 5 Adjust the frequency of an af oscillator by adjusting a trimmer capacitor (screwdriver) until specified frequency is read on a standard EPUT meter.

SLT 6 Set up and use a standard EPUT meter to measure the frequency of an af oscillator.

SLT 7 Adjust the output voltage of an af oscillator by adjusting a potentiometer for specified voltage as read on a standard VTVM.

SLT 8 Set up and use a standard pen recorder to measure a dc voltage.

SLT 9 Balance push-pull oscillator circuit by adjusting a potentiometer (screwdriver until a recording pen remains zero centered as front panel controls are turned. A pair of matched resistors must be connected to specified test points before adjustment is made.

SLT 10 Set up and use a Scorsby table and a multi-channel pen recorder to adjust a resolver circuit. Potentiometers (screwdriver) are adjusted for specified deflections of recording pens.

SLT 11 Adjust the limit switch on a sine drive assembly by adjusting a set screw until the unit cuts out at specified maximum frequency.

Task SMT Summing Amplifier Test Maintenance Check

SMT 1 Check and calibrate, if necessary, all voltmeters and VTVM's using a known accurate 0.25 per cent voltmeter.

SMT 2 Check and if necessary adjust the regulation of a dc regulated power supply using a variac, decade power resistance box, and built-in meters.

SMT 3 Adjust a potentiometer (screwdriver) until the output voltage of a regulated dc power supply remains within specified limits as the input voltage is varied with a variac and the load is changed with a resistance decade box.

SMT 4 Measure the ripple voltage of a regulated dc power supply with a standard VTVM. Load the power supply to full rated load with a power decade resistance box before measurement is made.

SMT 5 Adjust the frequency of an af oscillator by adjusting a trimmer capacitor (screwdriver) until specified frequency is read on a standard EPUT meter.

SMT 6 Set up and use a standard EPUT meter to measure the frequency of an af oscillator.

SMT 7 Adjust the output voltage of an af oscillator by adjusting a potentiometer for specified voltage as read on a standard VTVM.

SMT 8 Adjust the resistance of a circuit by varying a potentiometer (screwdriver) setting until the resistance as read on a standard VTVM is of specified value.

SMT 9 Measure a dc voltage at test points with a standard multimeter. If the voltage is not specified vary a potentiometer setting until voltage is correct.

SMT 10 Check an amplifier gain by applying an af signal on specified voltage to the input terminals and reading the output voltage on a standard VTVM.

SMT 11 Set up and use a standard af oscillator as a tes signal generator.

Task SNT Guidance Amplifier Test Equipment

Maintenance Check

SNT 1 Check and calibrate if necessary all voltmeters and VTVM's using a known accurate 0.25 per cent voltmeter.

SNT 2 Check and if necessary adjust the regulation of a dc regulated power supply using a variac, decade power resistance box, and built-in meters.

SNT 3 Adjust a potentiometer (screwdriver) until the output voltage of a regulated dc power supply remains within specified limits as the input voltage is varied with a variac and the load is changed with a resistance decade box.

SNT 4 Measure the ripple voltage of a regulated dc power supply with a standard VTVM. Load the power supply to full rated load with a power decade resistance box before measurement is made.

SNT 5 Adjust the frequency of an af oscillator by adjusting a trimmer capacitor (screwdriver) until specified frequency is read on a standard EPUT meter.

SNT 6 Set up and use a standard EPUT meter to measure the frequency of an af oscillator.

SNT 7 Adjust the output voltage of an af oscillator by adjusting a potentiometer for specified voltage as read on a standard VTVM.

SNT 8 Measure a dc voltage at test points with a standard multimeter. If the voltage is not as specified vary a potentiometer setting until voltage is correct.

SNT 9 Adjust the zero balance of a dc amplifier by changing the setting of a potentiometer (screwdriver) until the output voltage as read on a VTVM is zero.

SNT 10 Use a standard multimeter to read voltages at specified test points. Compare readings with specified values.

SNT 11 Set up and use a standard af oscillator as a test signal generator.

SNT 12 Use a standard af signal generator and a standard multimeter to adjust the phase shift of a demodulator. Change the setting of a trimmer capacitor (screwdriver) until the voltage read on the multimeter goes through a maximum value.

Task SOT Servo Amplifier Test Equipment

Maintenance Check

SOT 1 Calibrate voltmeters with a known accurate 0.5 per cent voltmeter and a dc power supply.

SOT 2 Check and if necessary adjust the regulation of a dc regulated power supply using a variac, decade power resistance box, and built-in meters.

SOT 3 Adjust a potentiometer (screwdriver) until the output voltage of a regulated dc power supply remains within specified limits as the input voltage is varied with a variac and the load is changed with a resistance decade box.

SOT 4 Measure the ripple voltage of a regulated dc power supply with a standard VTVM. Load the power supply to full rated load with a power decade resistance box before measurement is made.

SOT 5 Adjust the frequency of an af oscillator by adjusting a trimmer capacitor (screwdriver) until specified frequency is read on a standard EPUT meter.

SOT 6 Set up and use a standard EPUT meter to measure the frequency of an af oscillator.

SOT 7 Adjust the output voltage of an af oscillator by adjusting a potentiometer for specified voltage as read on a standard VTVM.

SOT 8 Balance a dc amplifier by adjusting potentiometer (screwdriver) settings according to prescribed procedure involving use of standard meters connected to test points.

Task SPT Activated Battery Box Tester

Maintenance Check

SPT 1 Visually inspect all relay contacts for signs of pitting. Dress contacts or replace relays if necessary.

SPT 2 Use a standard stop watch to measure the time delay of time delay relays. Make mechanical adjustment (screwdriver) if necessary to adjust relays to specified time delays.

SPT 3 Set reference and calibration voltages by making screwdriver adjustments to potentiometers for specified built-in meter readings, relay operations, and lamp indications. Switches and push buttons are thrown in specified sequence.

SPT 4 Perform simple arithmetic computations to determine reference voltage settings.

Task SQT Component Power Supply Test Rack

Maintenance Check

SQT 1 Calibrate all panel meters with a variable voltage supply and a known accurate 0.2 per cent voltmeter.

SQT 2 Set up and use a VTVM to measure voltages at test points. Compare values with specified voltages.

SQT 3 Calibrate an elapsed time meter using a standard stop watch.

SQT 4 Use a multimeter to check circuit continuity and resistance values which are compared with specified resistance.

SQT 5 Use a VTVM to measure the ripple voltage at the output of a power supply.

SQT 6 Use a standard stop watch to measure the delay interval of a time delay relay.

SQT 7 Throw switches and depress push buttons while observing indicator lights for proper operation.

SQT 8 Use a multimeter to measure power supply output voltages after specified loads are set on a power resistance decade box.

SQT 9 Use a multimeter to read voltages at test points and compare values with specified voltages.

SQT 10 Adjust a potentiometer (screwdriver) for specified voltage as read on a voltmeter connected to test points.

PETREL

Task PA Missile Control System Maintenance Check

PA 1 Make necessary microwave and electric cable connections between missile components and test consoles.

PA 2 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

PA 3 Use a standard VTVM to measure dc voltage appearing at test points.

PA 4 Adjust servo amplifier gain by performing screwdriver potentiometer adjustment while observing a standard VTVM.

PA 5 Adjust AFC voltage by performing screwdriver potentiometer adjustment while observing a standard VTVM.

PA 6 Adjust receiver gain by performing screwdriver potentiometer adjustment while observing a standard multimeter.

PA 7 Adjust AFC voltage by performing screwdriver potentiometer adjustment while observing a standard multimeter.

PA 8 Set up and use a synchroscope to measure frequency by Z - axis modulation.

PA 9 Set up and use a standard audio generator for Z - axis modulation of synchroscope.

PA 10 Adjust the frequency of phase shift oscillator by performing screwdriver potentiometer adjustment.

PA 11 Tune a reflex klystron local oscillator by performing potentiometer adjustment of repeller voltage and micrometer adjustment of cavity while observing crystal current with standard multimeter and AFC voltage with a VTVM.

PA 12 Use a standard ammeter to read magnetron current available at test point.

PA 13 Adjust rf amplifier gain by performing a screwdriver potentiometer adjustment.

PA 14 Use an echo box, antenna, and special oscilloscope to monitor and adjust resonant frequency of rf switch tubes.

PA 14a Set up and orient echo box with respect to radar antenna.

PA 14b Use special test console oscilloscope to observe pulse wave forms.

PA 14c Adjust resonant cavity frequency of switch tubes by screwdriver adjustment while observing wave forms on oscilloscope.

PA 15 Set up and orient echo box with respect to radar antenna.

PA 15a Connect microwave equipment using rf cables and wave guides.

PA 15b Use standard microwave generator to determine radar transmitter frequency by heterodyne action.

PA 15c Perform algebraic operations to determine power level from meter reading attenuator settings, and cable lengths.

PA 16 Add attenuator readings to obtain signal levels in db.

PA 17 Simulate target by performing front panel manipulations of microwave signal generator according to specified procedures.

PA 17a Use standard microwave signal generator to simulate radar target echo signal.

PA 18 Use an echo box, antenna, microwave signal generator, and test console to measure radar receiver sensitivity.

PA 18a Use standard microwave generator to measure sensitivity.

PA 18b Use special test console oscilloscope to observe signal and noise during a receiver sensitivity check.

PA 18c Perform algebraic operations to determine power level from meter reading, attenuator settings, and cable lengths.

PA 19 Use an echo box, antenna, microwave signal generator, and test console to measure tracking rate (memory) performance. This task involves performing carefully time front panel manipulations.

PA 19a Use standard microwave signal generator to simulate moving target.

PA 19b Use stop watch to time sequence of signal application and removal.

PA 19c Use special test console oscilloscope to observe pulse coincidence.

PA 20 Use test console and standard microwave generator to measure antenna pattern from echo strength produced in radar receiver. Antenna is rotated and angle read from protractor while signal strength is read from VTVM.

PA 21 Set up and use synchroscope to measure pulse spacing.

PA 22 Adjust time delay by performing screwdriver adjustment of potentiometer while pulses are viewed on synchroscope.

PETREL

Task PB Missile Junction Box Maintenance Check

PB 1 Perform continuity checks from junction box terminals to specified test points using wiring diagram and multimeter.

Task PC Auto Pilot Maintenance Check

PC 1 Make necessary microwave and electric cable connections between missile components and test consoles.

PC 2 Set up and use standard VTVM to measure power supply output voltages appearing at test points.

PC 3 Use potentiometer (screwdriver) to adjust dc voltage appearing at test point using standard VTVM as indicating device.

PC 4 Adjust control surface potentiometers to position control surfaces.

PC 5 Adjust uncaged gyro attitude by performing potentiometer (screwdriver) adjustment.

PC 6 Manipulate front panel controls on test console and observe control surface response.

PC 7 Adjust altitude reference compensator by front panel manipulation on test console and by performing mechanical adjustments (hand tool) in missile.

PC 7a Adjust altitude reference compensator by front panel manipulation on test console.

PC 7b Adjust altitude reference compensator by performing mechanical (hand tool) adjustments in missile.

Task PD Altimeter Maintenance Check

PD 1 Use hand tools to fabricate a delay line following specific instructions.

PD 2 Use graph to determine appropriate receiver output voltage.

PD 3 Use VTVM, delay line, and make potentiometer adjustment to calibrate altimeter from receiver output voltage.

Task PE Control Surface Trim

PE 1 Position and read level bubble and protractor settings in decalage gage. Set trim tabs in accordance with decalage gage readings.

Task PAT Pre-launching Missile Control Unit

(Missile Monitoring and Control Unit)

Maintenance Check

PAT 1 Set up and use a dual gun, linear sweep, and single gun, circular sweep, oscilloscopes; set up involves performing potentiometer (screwdriver) adjustments according to specified procedure.

PAT 2 Use 0-4500 rpm variable speed motor, tachometer, and tachometer indicator to activate relay interlock circuits.

PAT 3 Use variable dc voltage source to apply test voltage in junction box with a multimeter.

PAT 4 Adjust dc voltage level, to control relay activation level, by performing potentiometer (screwdriver) adjustment.

PAT 5 Service relays to correct poor contacts, open coils, and frozen contacts, using ohmmeter and simple hand tools.

PAT 6 Fire thyratron switch tube (by eliminating bias) to check thyratron and associated relay operation.

PAT 7 Use multimeter to check tube filament voltage.

PAT 8 Use multimeter to check dc supply voltage.

PAT 9 Set up and use VTVM with multiplier probe to check high voltage supply.

PAT 10 Set up and use standard oscillo-synchroscope to monitor wave forms appearing at test points and within the chassis. Compare actual waveforms with pictures of normal waveforms for amplitude and shape.

DOVE

Task DA Missile Control System Operational Check
Using a Programmed Test Console
(Pre-Flight Checkout Console)

DA 1 Mount and remove missile tail and nose components in test console.

DA 2 Make electrical cable and pneumatic connections between missile components and test console.

DA 3 Secure arming wire loops to arming device latches on test console.

DA 4 Warm up test console and observe counter, resetting manually if necessary. Throw switch to begin automatic test. Observe Go-No-Go indicator lights.

DA 5 Observe indicator lights and counter for location of fault.

DA 6 Shut down console by throwing switch.

DA 7 Check for correct operation of test console by throwing switches to start automatic self test and observe indicator lights.

Task DB Generator Voltage Regulator
(Carbon Pile) Maintenance Check

DB 1 Adjust carbon pile regulator by adjusting rheostat, magnetic core position, and pile pressure screw until output voltage and regulation are as specified.

DB 2 Adjust and lock magnetic core with generator running at specified speed and load so that rheostat can control voltage between specified limits.

Task DC Dynamotor Voltage Regulator
(Carbon Pile) Maintenance Check

DC 1 Adjust carbon pile regulator by adjusting magnetic core position and pile pressure screw so that regulation is as specified.

DC 2 Adjust carbon pile core screw for prescribed no load output voltage. Rheostat should be at specified setting.

Task DD Voltage Regulator Maintenance Check

DD 1 Adjust potentiometer for specified output voltage on external voltmeter.

Task DE Signal Amplifier Maintenance Check

DE 1 Adjust AGC delay potentiometer for specified voltage at test point as measured by VTVM. Set up and use audio oscillator and microvolter to furnish specified input signal.

DE 2 Set up and use a standard oscilloscope.

DE 3 Adjust horizontal and vertical channel potentiometer so that specified input signals give specified outputs as indicated by observing direct-coupled oscilloscope.

Task DF Aileron Actuator Maintenance Check

DF 1 Adjust total aileron movement with jam nut. Pin nut to piston rod.

DF 2 Adjust and lock aileron adjusting rod with groove pin so that ailerons move the same amount on either side of mechanical zero.

APPENDIX C

TESTING AND ADJUSTMENT: BEHAVIORAL CATEGORIES AND ASSOCIATED BEHAVIOR STATEMENTS, ALL MISSILES COMBINED

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TESTING AND ADJUSTMENT: BEHAVIORAL CATEGORIES AND ASSOCIATED BEHAVIOR STATEMENTS, ALL MISSILES COMBINED

Coding System

Each task and behavior statement was coded. This facilitated the identification of a particular statement when it was placed on a separate card and sorted with other behavior statements describing other tasks in the same missile and in different missiles. The coding system is as follows:

a) The first letter indicates the missile concerned:
T = Terrier, R = Regulus, S = Sparrow, P = Petrel,
D = Dove.

b) The second and/or third letter indicates the task concerned:
(1) Tasks concerned with the testing and adjustment of the missile were lettered A, B, C, etc.
(2) Tasks concerned with the testing and adjustment of missile test equipment were lettered AT, BT, CT, etc.
(3) Tasks concerned with the testing and adjustment of external guidance equipment were lettered AE, BE, CE, etc.

c) The number following the letters indicates the number of a behavior statement used to describe a particular task.

Examples:

TA 1 indicates Terrier, Task A (a task performed on a missile), Behavior Statement 1.

TAT 5 indicates Terrier, Task AT (a task performed on test equipment), Behavior Statement 5.

RBE 7 sub indicates Regulus, Task BE (a task performed on external guidance equipment), Behavior Statement 7, ("sub" indicates that the behavior is one that would probably be performed by a missileman assigned to submarine duty).

Category 1. Adjusting Circuit Performance with Potentiometers, Coupling Loops, Tuning Slugs, and Trimmer Condensers:

a. AFC, AGC, and control bias voltages of rf and if amplitude.

RU 12 Tune radar receiver by making adjustments in specified sequence to the LO injection probe, the receiver tuning dial, and the LO bias potentiometer (screwdriver) for prescribed readings on a crystal current meter and for maximum or minimum sound in headphones.

PA 5 Adjust AFC voltage by performing screwdriver potentiometer adjustment while observing a standard VTVM.

PA 6 Adjust receiver gain by performing screwdriver potentiometer adjustments while observing a standard multimeter.

PA 7 Adjust AGC voltage by performing screwdriver potentiometer adjustment while observing a standard multimeter.

PA 13 Adjust rf amplifier gain by performing a screwdriver potentiometer adjustment.

PD 3 Use VTVM, delay line, and make potentiometer adjustment to calibrate altimeter from receiver output voltage.

DE 1 Adjust AGC delay potentiometer for specified voltage at test point as measured by VTVM. Set up and use audio oscillator and microvolter to furnish specified input signal.

TFT 6c Set switch to feed internally generated signal into if amplifier; adjust receiver bias potentiometer until specified output is obtained with specified input. Read voltages on a built-in VTVM.

TGT 5 Adjust receiver AGC voltage by setting switches and controls, and adjusting potentiometers (screwdriver) for specified reading on built-in meters.

TGT 9c (Same as TFT 6c)

SBT 1 Adjust an AGC voltage as read on a built-in meter, to specified valve by making screwdriver adjustment to a potentiometer.

RBE 7 sub Adjust an amplifier gain by adjusting a bias voltage potentiometer (screwdriver) so that specified output voltage is obtained with specified input. Determine if the bias, as measured on a built-in meter, is within specified limits.

RCE sub 7 Adjust potentiometers (screwdriver) so that waveforms viewed on a synchroscope have desired peak to peak amplitude, and slope.

RJE sub 4 Adjust an amplifier gain by adjusting a bias voltage potentiometer (screwdriver) so that specified output voltage is obtained with specified input. Determine if bias, as measured on built-in meter, is within specified limits.

ROE 5 Set up and use a synchroscope to monitor pulse waveshape from the Range Tracker. If necessary adjust a potentiometer to obtain desired waveshape.

b. Gain of dc and af amplifiers

RW 2 Level gyro by turning control knobs on tilt table, zero meters with trim knobs, and throw switches to specified initial positions.

SA 11 Adjust control system gain by making screwdriver adjustments on gain potentiometers until the proper wing deflections are noted.

SB 18 (Same as SA 11).

SE 11 Adjust amplifier gain by making screwdriver adjustments on gain potentiometers until output signal amplitude as read on VTVM is consistent with specified gain.

SE 18 Adjust oscillator output voltage by adjusting a resistance decade box until specified voltage is read on a VTVM connected to test points.

SF 12 Adjust the gain of an audio amplifier by making adjustments to resistance decade box for a specified voltage as read on VTVM, connected to test points. Adjustments must be made in sequence according to a specified procedure.

PA 5 Adjust servo amplifier gain by performing screwdriver potentiometer adjustment while observing a standard VTVM.

SIT 1 Use a variable ac voltage as a signal source and a VTVM to measure output signal for adjusting the gain of a dc amplifier.

SIT 2b Use potentiometer to adjust gain of dc amplifier at various frequencies.

SLT 7 Adjust the output voltage of an af oscillator by adjusting a potentiometer for specified voltage as read on a standard VTVM.

SMT 7 (Same as SLT 7).

SNT 7 (Same as SLT 7).

SOT 7 (Same as SLT 7).

c. Frequency of af oscillators

SE 17 Adjust oscillator frequency by adjusting capacitor decade box until desired frequency is indicated by EPUT meter.

PA 10 Adjust the frequency of phase shift oscillator by performing screwdriver potentiometer adjustment.

SKT 5 Tune an audio oscillator to specified frequency by making screwdriver adjustment to a tuning capacitor until the correct frequency is indicated on a standard frequency meter.

SLT 5 Adjust the frequency of an af oscillator by adjusting a trimmer capacitor (screwdriver) until specified frequency is read on a standard EPUT meter.

SMT 5 (Same as SLT 5).

SNT 5 (Same as SLT 5).

SOT 5 (Same as SLT 5).

d. Resonant frequency and coupling of rf or if circuits.

RB 6 Adjust the coupling between a local oscillator and a crystal mixer for desired crystal current by manually turning coupling loop rod.

RB 9 Adjust if transformers for peak response using standard signal generator, triggered by standard pulse generator, as a signal source and a synchroscope as an output monitor. Transformers are slug (screwdriver) tuned.

RU 12 Tune radar receiver by making adjustments in specified sequence to the LO injection probe, the receiver tuning dial, and the LO bias potentiometer (screwdriver) for prescribed readings on a crystal current meter and for maximum or minimum sound in headphones.

TCT 4 Set up and use rf signal generator and standard VTVM to adjust coil tuning slug position for peak output, using built-in antenuator in signal generator to keep output voltage at desired value.

TGT 4 Adjust frequency and frequency deviation of internally generated FM pulse signal by setting switches, and controls, setting up and using a specially calibrated VTVM, and, if necessary, performing a screwdriver potentiometer adjustment.

SFT 5 Adjust a trimmer capacitor to tune an osicllator circuit for correct frequency of oscillation and check amplitude of output signal.

RJE sub 3 Adjust local oscillator coupling by turning knob so that desired crystal current as read on built-in meter is obtained.

e. Voltage output of resistive voltage dividers

RS 12 Adjust potentiometer controls (screwdriver) for specified voltages as read on a standard VTVM.

RU 9 Set critical voltages by making screwdriver adjustments to a potentiometer until desired voltage values are read on a VTVM.

PC 3 Use a potentiometer (screwdriver) to adjust dc voltage appearing at test point using standard VTVM as indicating device.

TMT 5 Perform potentiometer (screwdriver) adjustment using standard multimeter until voltages as measured at test points are of specified value.

TKT 5 Set a relay supply voltage to a specified value by adjusting a potentiometer with screwdriver until the desired voltage value is read on a VTVM.

SPT 3 Set reference and calibration voltages by making screwdriver adjustments to potentiometers for specified built-in meter readings, relay operations, and lamp indications. Switches and push buttons are thrown in specified sequence.

SQT 10 Adjust a potentiometer (screwdriver) for specified voltage as read on a voltmeter connected to test points.

SMT 8 Adjust the resistance of a circuit by varying a potentiometer (screwdriver) setting until the resistance as read on a standard VTVM is of specified value.

PAT 4 Adjust dc voltage level, to control relay activation level, by performing potentiometer (screwdriver) adjustment.

f. Electrical and mechanical zero of control surfaces and gyro mounts

TP 8 Adjust wing trim potentiometers for wing position indicator zero at center of mechanical back lash. Ground servo amplifier input terminals before adjustment is made.

SM 10 Manually center hydraulic actuators and adjust a trim potentiometer for zero reading on a VTVM to zero a servo system. Lock (lock-nut) the potentiometer in this position.

PC 4 Adjust control surface potentiometers to position control surfaces.

PC 5 Adjust uncaged gyro attitude by performing potentiometer (screwdriver) adjustment.

g. Tune resolvers

SFT 15 Align a two phase resolver by tuning the driver transformer with a trimming capacitor. Adjust trimmer until the output signal carries minimum noise as viewed on an oscilloscope.

SLT 10 Set up and use a Scorsby table and a multi-channel pen recorder to adjust a resolver circuit. Potentiometers (screwdriver) are adjusted for specified deflections of recording pens.

Category 2. Adjusting Controls, Setting Switches, and Reading Quantitative Indications on Meters or Gages:

TB 5 Set controls and warm up test console. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator settings.

TB 6 Set switches which inject test signals into control system components and manually rotate missile in test stand; and note system response as measured by built-in indicating or recording instruments, inicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

TC 2 (Same as TB 5).

TC 5 Set switches which inject test signals into receiver and read output signal levels on built-in meters. Record meter readings and compare with specified values.

RL 8 Set switches and dials which control the radiated signal into the missile control system and note system response as measured by indication instruments or control surface position.

RS 4 Set up and use a radio command transmitter to transmit a test signal for a receiver check.

RS 11 Adjust control console front panel controls to specified knob readings or voltage output as read on a standard VTVM.

RT 3 Check operation of missile component by throwing switches on test console in proper sequence and reading built-in meters and indicator lamps. Check readings or indications with those specified on check list.

RW 3 Tilt gyro to specified angles by operating tilt table control knobs and read control surface meters and measure voltages at specified test points.

RW 20 Tilt gyros to specified angles by changing control knobs and read deflection of control surfaces on protractors.

RX 2 Throw switches on test console to initial position, zero meters with manual knobs and check indicator lamps for proper initial indications.

RX 3 Read and record built-in meters as radio command transmitter operator executes command functions.

RX 4 Check the missile hydraulic system by reading bourdon gages and compare readings with pressures specified.

RX 6 Use a stop watch to measure the time required for control surfaces to move to specified positions and gyros to precess as commands are executed at the Radio Command transmitter.

SA 3 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SA 13 Set switches which inject test signal into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SB 3 (Same as SA 3).

SB 5 (Same as SA 13).

SC 3 Connect missile component to special battery box test set. Clamp chassis in holder and make electric cable connections. Set up and warm up test set by throwing switches, adjusting potentiometer control knobs, and making jumper connections in prescribed sequence.

SD 2 Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.

SD 6 Set switches which inject test signals into control system components; and note system response as measured by built-in indicating or recording instruments, indicating lamps or wing positions. Meter readings and lamp indications are recorded and compared with specified normal values.

SE 2 (Same as SD 2).

SE 10 (Same as SD 6).

SF 2 (Same as SD 2).

SF 5 (Same as SD 6).

SG 3 (Same as SD 6).

SG 5 (Same as SD 2).

SH 4 (Same as SD 6).

SH 5 (Same as SD 2).

SI 2 (Same as SD 2).

SI 3 (Same as SD 6).

SJ 2 (Same as SD 2).

SJ 3 (Same as SD 6).

SM 3 (Same as SD 2).

SN 2 (Same as SD 2).

SN 3 (Same as SD 6).

SO 3 (Same as SD 2).

SO 4 (Same as SD 6).

SP 3 Depress push buttons in specified sequence and read meters, timers and indicator lamps for indications of circuit per formance.

PA	2	Set controls and warm up test consoles. Throw switches to initial positions and adjust potentiometer control knobs to specified dial or indicator setting.
PC	6	Manipulate front panel controls on test console and observe control surface response.
PC	7a	Adjust altitude reference compensator by front panel manipulation on test console.
TAT	2	Connect and use variac to adjust line voltage.
TBT	6	Make necessary electrical cable connections between beam simulator, and beam simulator test set. Set switches and adjust potentiometer control knobs as specified.
TFT	2	Turn on power, warm up console, and set controls. Check fuze indicator lights. Read line voltage on built-in meter and set switch accordingly. Read power supply output voltages on built-in meters and if necessary perform potentiometer adjustment to correct voltages.
TGT	1	(Same as TFT 2).
THT	1	(Same as PA 2).
THT	4	Set switches and potentiometer control knobs to specified settings. Install jumpers between cable plug pins. Observe multimeter readings, built-in meter, and lamp indications to check performance of test console.
TIT	1	(Same as PA 2).
TIT	3	Set switches which inject test signals into console test unit and record response as measured by built-in indicating or recording instruments and indicating lamps. Meter readings and lamp indications are recorded and compared with specified normal values.
SBT	4	Adjust line voltage, as read on an ac VTVM, to specified values by adjusting input variac control.
RLE sub	1	Connect missile components to 110 v line; visually check switch positions, fuze installation, and tube filament operation. Use autotransformer to correct line voltage as read on built-in meter.

Category 3. Adjust Microwave Oscillators, Wave Guides, and Resonant Cavities:

a. Tune klystrons and lighthouse tubes

TC 3 Tune a klystron local oscillator for a stable mode of operation at a given frequency and power level.

RB 1a Adjust lighthouse local oscillator frequency by manually adjusting tuning cavity slug.

RB 5 Tune a resonant cavity by adjusting (screwdriver) a tuning slug while observing synchroscope.

SA 4 Tune a klystron oscillator to a stable mode of oscillation at a prescribed frequency.

SA 4a Read a micrometer vernier dial.

SA 4b Use a coaxial frequency meter, a wattmeter bridge, and bias supply meters to determine correct adjustments for tuning a klystron oscillator.

SB 12 (Same as SA 4).

SB 12a (Same as SA 4a).

SB 12b (Same as SA 4b).

SO 5 (Same as SA 4).

SO 5a (Same as SA 4a).

SO 5b (Same as SA 4b).

PA 11 Tune a reflex klystron local oscillator by performing potentiometer adjustment of repeller voltage and micrometer adjustment of cavity while observing crystal current with a standard multimeter and AFC voltage with VTVM.

TFT 6b Perform potentiometer adjustment of klystron repeller voltage to peak if output.

TGT 3 Tune radar receiver (klystron local oscillator) to frequency of incoming signal.

TGT 6a Check that radar receiver tuning is tuned to frequency of signal source.

TGT 9b (Same as TFT 6b).

RBE 8 sub — Tune a reflex klystron local oscillator by performing potentiometer adjustment of repeller voltages and micrometer adjustment of cavity. Observe mixer current on built-in meter, and receiver pulse output on synchroscope.

RJE 9 sub — (Same as RBE 8 sub).

RJE 10 sub — Tune a resonant cavity by adjusting (screwdriver) tuning slug while observing a synchroscope.

b. Tune magnetrons

RE 6 — Observe the magnetron output frequency on a microwave spectrum analyzer and if required perform screwdriver adjustment of tuning control.

RJ 3 — (Same as RE 6).

RU 10 — Set up and use a standard rf frequency meter to tune a radar transmitter to prescribed frequency.

RU 13 — Tune a radar transmitter by adjusting tuning control for prescribed frequency as read on a standard frequency meter.

RU 14 — Adjust the coupling probe on a radar transmitter for maximum reading on a standard rf power meter.

RIE 7 sub — Set up and use a microwave spectrum analyzer to measure magnetron frequency.

RIE 8 sub — (Same as RE 6).

c. Measure and adjust klystron frequency pulling

SA 4c — Switch the output of a built-in pulse generator to a klystron oscillator. Adjust pulse amplitude for proper per cent modulation as read from built-in meter. Readjust klystron frequency with fine frequency control.

SB 12c — (Same as SA 4c).

SO 5c — (Same as SA 4c).

TGT 6 Apply ac voltage of specified value to klystron repeller and use a built-in special discriminator in conjunction with a synchroscope and VTVM to determine a frequency pulling calibration constant. This procedure includes setting switches and controls, building a simple R-C network for voltage dividing and coupling purposes, and performing simple arithmetic computations.

TFT 10 Use synchroscope and special built-in discriminator to measure frequency pulling of rf source by setting and adjusting switches and controls, observing discriminator output on synchroscope, and multiplying peak to peak amplitude of this signal by a known calibration constant.

d. Adjust wave guides and resonant cavities

SA 7 Tune a conventional microwave stub transformer to maintain an impedance match between a microwave generator and a transmission line. The adjustment is determined by reading a built-in microwave power meter.

SB 15 (Same as SA 7).

SO 8 (Same as SA 7).

PA 14c Adjust resonant cavity frequency of switch tubes by screwdriver adjustment while observing wave forms on oscilloscope.

RBE 2 sub Perform screwdriver adjustment of klystron local oscillator tuning while observing crystal current meter.

e. Measure power output

RE 1 Set up a microwave transmitter for output tests by using rf test load, special detector, and external trigger source.

RE 7 Set up and use an rf power meter to measure average transmitter power output.

RE 11 Use a neon rf indicator to determine if transmitter is operating.

RJ 4 Set up and use an rf power meter to measure average transmitter power output.

RU 4 Set up and use a standard rf power meter to determine the power output of a radar transmitter.

RIE 1 sub — Set up a microwave transmitter for output tests by using on rf test load, special detector, and external trigger source.

RIE 9 sub — Set up and use an rf power meter to measure average transmitter power output.

f. Construct and adjust delay lines

PD 1 — Use hand tools to fabricate a delay line following specific instructions.

SFT 10 — Adjust the trimming capacitors of a pulse forming delay line to obtain specified output pulse shape as viewed on an oscilloscope. Adjustments are made to affect the rise time, overshoot, flatness of top, delay time, and the pulse width of the output pulses. The signal must be applied directly to the deflection plates of the oscilloscope so as not to obscure the high frequency components of the pulses.

SFT 12 — Change the taps on pulse forming delay lines to adjust the spacing of microwave pulses.

g. Measure antenna pattern

PA 14a — Set up and orient echo box with respect to radar antenna.

PA 15 — (Same as PA 14a).

PA 20 — Use test console and standard microwave generator to measure antenna pattern from echo strength produced in radar receiver. Antenna is rotated and angle read from protractor while signal strength is read from VTVM.

Category 4. Balancing Electronic Circuits by Component Adjustment or Replacement:

TB 9 — Adjust phasing potentiometer control knobs for minimum signal voltages as read on a built-in meter. Adjustments are made alternately on the two channels for best compromise minimum voltage.

SE 12 — Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method to adjust oscillator output amplitude and to balance modulator and amplifier.

SE 13 Set up and use a standard capacitance decade box for determining required circuit capacitance by the substitution method to adjust oscillator frequency and to balance modulator and amplifier.

SE 15 Balance push-pull audio or dc amplifiers by making adjustments to resistance and capacitance decade boxes for specified readings on a VTVM connected to test points. Adjustments must be made in sequence according to specified procedure.

SG 7 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method in order to adjust the dynamic gain and balance of amplifier and to correct static balance of amplifier.

SG 8 Balance and adjust the gain of a push-pull dc amplifier by making adjustments to a pair of resistance decade boxes. Adjustments are made in sequence according to a specified procedure for specified voltages as read from a VTVM connected to test points.

TGT 10 Adjust and equalize phase shifts of the test console circuits by setting and adjusting controls according to a specified procedure and reading voltages on a built-in VTVM.

TJT 3 Balance a push-pull dc amplifier by adjusting balancing potentiometer control knobs for zero output (VTVM) with zero input signal. Change vacuum tube if balance cannot be obtained.

SET 8b Balance and calibrate an af push-pull amplifier by making screwdriver adjustments to potentiometers. Adjustments are made to obtain specified voltages at specified test points in the circuit using a VTVM as an indicating instrument.

SFT 13 Balance the amplitude of pulses from pulse forming circuits by selecting vacuum tubes of similar characteristics. Seclect tubes by observing the output pulses on an oscilloscope after tube replacements.

SIT 5 Balance a dc amplifier by adjusting balancing potentiometers (screwdriver). Adjustments are made to obtain specified voltages at specified test points in the circuit using a VTVM as an indicating instrument.

SKT 1 Balance a dc amplifier by making front panel knob adjustments for specified built-in meter readings.

SKT 3 Balance a dc amplifier by substituting a standard resistance decade box for the fixed balancing resistor and adjust decade box for amplifier balance as indicated on built-in meter.

SLT 9 Balance a push-pull oscillator circuit by adjusting a potentiometer (screwdriver) until a recording pen remains zero centered as front panel controls are tuned. A pair of matched resistors must be connected to specified test points before adjustment is made.

SNT 9 Adjust the zero balance of a dc amplifier by changing the setting of a potentiometer (screwdriver) until the output voltage as read on a VTVM is zero.

SOT 8 Balance a dc amplifier by adjusting potentiometer (screwdriver) settings according to prescribed procedure involving use of standard meters connected to test points.

ROE sub 1 Check and if necessary adjust a servo amplifier's balance by setting an input potentiometer to a minimum, manipulating balance potentiometer and observing a standard VTVM to determine whether the output is zero or minimum.

ROE sub 2 Check and if necessary adjust a dc amplifier balance by disconnecting an input signal, manipulating a balance potentiometer and observing a standard VTVM to determine whether the output is zero, or minimum.

Category 5. Checking and Adjusting Power Supplies:

a. Measurement of ripple voltage

TKT 3 Use a standard VTVM for checking the ripple voltage output of a regulated power supply.

SAT 3 Set up and use an ac VTVM for measuring ripple voltage of dc power supply.

SCT 2 Set up and use an ac VTVM for measuring ripple voltage of dc power supply. Because of high dc level of output an auxiliary protective network shall be included between the power supply and the VTVM.

SET 7c Use an ac VTVM to check ripple voltage output of a regulated dc power supply. Observe that the maximum specified ripple output is not exceeded for conditions of maximum and minimum load current and maximum and minimum input voltage.

SFT 17c (Same as SET 7c).

SGT 3c (Same as SET 7c).

SHT 5c (Same as SET 7c).

SQT 5 Use a VTVM to measure the ripple voltage at the output of a power supply.

SLT 3 Measure the ripple voltage of a regulated dc power supply with a standard VTVM. Load the power supply to full rated load with a power decade resistance box before measurement is made.

SMT 4 (Same as SLT 3).

SNT 4 (Same as SLT 3).

SOT 4 (Same as SLT 3).

RLE sub 9 Measure power supply ripple voltage with a VTVM.

b. Determination of regulation with variable input and/or variable loads

TAT 6 Use test load resistor, bucking battery, and voltmeter to determine power supply regulation as a function of supply voltage variation. Use variac to vary supply voltage between specified limits.

TKT 4 Set up and use an audio oscillator and a VTVM for determining the output impedance of a regulated power supply. The oscillator must be connected to the power supply through a special R-C network and a special voltage calibration load.

SAT 5 Read VTVM to check regulation of dc power supply output voltage as input voltage is varied.

SET 7b Check the voltage regulation of a regulated dc power supply by varying the load resistance and then the input voltage to the supply.

SFT 17b (Same as SET 7b).

SGT 3b (Same as SET 7b).

SHT 5b (Same as SET 7b).

SQT 8 Use a multimeter to measure power supply output voltages after specified loads are set on a power resistance decade box.

SLT 2 Adjust a potentiometer (screwdriver) until the output voltage of a regulated dc power supply remains within specified limits as the input voltage is varied with a variac and the load is changed with a resistance decade box.

SMT 2 Check and if necessary adjust the regulation of a dc regulated power supply using a variac, decade power resistance box, and built-in meters.

SMT 3 (Same as SLT 2).

SNT 2 (Same as SMT 2).

SNT 3 (Same as SLT 2).

SOT 2 (Same as SMT 2).

SOT 3 (Same as SLT 2).

RLE sub 4 Use a power resistance decade box as a load, a series connection of batteries as a bucking voltage, a VTVM, a milliameter, and a variac to make power supply regulation measurements.

RLE sub 7 Measure power supply output voltage at specified load, as input voltage is changed with autotransformer. Calculate per cent change of output voltage.

RLE sub 8 Measure a power supply output voltage as a function of load resistance (decade box) variation.

c. Measurement of operation at specified input and load

RM 2 Manipulate front panel control to adjust dc output voltage of special test set. Read output voltage on built-in meter.

SJ 6 Replace fixed resistors and/or adjust variable potentiometer (screwdriver) to adjust output voltages of a rectifier power supply according to a prescribed procedure.

SJ 13 Adjust the output voltage of a power supply by adjusting a resistance decade box for a specified voltage reading on a built-in meter.

SN 6 Adjust output voltage and ripple voltage to specified values by adjusting potentiometers (screwdriver) or tapped resistors for correct output meter readings.

PC 2 Set up and use standard VTVM to measure power supply output voltages appearing at test points.

DD 1 Adjust potentiometer for specified output voltage on external voltmeter.

TAT 15 Adjust power supply potentiometer (screwdriver) until output voltage as measured by standard multimeter is a specified value.

TJT 1 Adjust a regulated power supply for correct output voltage by making a screwdriver adjustment to a potentiometer while measuring the output with a standard VTVM.

TJT 2 Adjust two regulated power supplies for a minimum specified difference voltage by alternately and in proper sequence adjusting (screwdriver) two control potentiometers and reading a VTVM.

TKT 2 Adjust a regulated power supply for proper output voltage. Connect a special voltage calibration load to the power supply output terminals. Vary a potentiometer control knob for specified output voltage as read on a built-in VTVM.

SAT 2 Adjust output voltage by making screwdriver adjustment to potentiometer. Set specified voltage as read on voltmeter to three significant figures.

SCT 3 Set up and use a standard multimeter for measuring power supply output voltages.

SET 7 Check and adjust a regulated power supply.

SET 7a Adjust the output voltage of a regulated dc power supply by making a screwdriver adjustment on a potentiometer. The adjustment cannot be made until a dummy load of the proper resistance is connected across the proper output terminal.

SFT 4 (Same as SET 7a).

SFT 17 Check and adjust a regulated power supply.

SFT 17a (Same as SET 7a).

SGT 3 (Same as SFT 17).

SGT 3a (Same as SET 7a).

SHT 5 (Same as SFT 17).

SHT 5a (Same as SET 7a).

SLT 11 Check and if necessary adjust the regulation of a dc regulated power supply using a variac, decade power resistance box, and built-in meters.

SLT 4 Adjust the output voltages of a regulated dc power supply by adjusting potentiometers (screwdriver) until specified voltages are read on a known accurate voltmeter. Load the power supply to full rated load with a power decade resistance box before adjustment is made. Reference the built-in meters at the specified voltages.

SMT 9 Measure a dc voltage at test points with a standard multimeter. If the voltage is not as specified vary a potentiometer setting until voltage is correct.

RLE 2 sub Connect a power decade resistance box to power supply output and adjust for specified current as read on a standard milliameter. Adjust the power supply voltage adjustment control (screwdriver potentiometer) and determine range of adjustment possible as read on standard VTVM.

RME 7 sub Use a laboratory standard voltmeter (1% accuracy) to measure power supply output.

RME 1 Adjust regulated power supply outputs with potentiometer (screwdriver).

d. Carbon Pile regulator adjustments

DB 1 Adjust carbon pile regulator by adjusting rheostat, magnetic core position, and pile pressure screw until output voltage and regulation are as specified.

DB 2 Adjust and lock magnetic core with generator running at specified speed and load so that rheostat can control voltage between specified limits.

DC 1 Adjust carbon pile regulator by adjusting magnetic core position and pile pressure screw so that regulation is as specified.

DC 2 Adjust carbon pile core screw for prescribed no load output voltage. Rheostat should be at specified setting.

Category 6. Connecting and Disconnecting Electrical, Pneumatic and Hydraulic Fittings:

TB 14 Shut down test equipment. Hydraulic, air, and electrical power must be terminated in proper sequence and all lines and cabling between console and missile removed.

RA 1 Make electrical cable connections between missile components.

RM 1 Make necessary electric cable connections between equipment and special test set. Set switches as prescribed.

RN 1 (Same as RM 1).

RR 1 Remove unit from metal pressurized case after bleeding air pressure and make necessary electrical cable connection. Warm up unit.

RR 2 Set controls as specified and insert desired crystals into crystal sockets.

RS 1 (Same as RR 1).

RT 1 Make electrical cable connections between test console and missile.

RU 1 Make electrical and rf cable connections between test console and missile components. Turn on equipment and observe specified warm-up time.

RV 1 Connect electrical and rf cables between test set control box and missile components. Terminate antenna connections with proper dummy loads. Tunr on power and observe prescribed warm-up time.

RW 1 Make electrical cable connections between test bench and missile components. Mount gyro on special tilt table. Turn power ON and observe prescribed warm-up time.

RX 1 Connect electric cables between test console and missile. Turn on radio command equipment and the autopilot and observe prescribed warm-up times.

SA 15 Shut down test equipment. Hydraulic, air and electrical power must be terminated in proper sequence and all lines and cabling between test consoles and missiles removed.

SB 19 (Same as SA 15).

SC 2 Make necessary electric cable connections between the missile component and test set.

SD 1 Make necessary electric cable connections between the missile component and the test consoles.

SE 1 (Same as SD 1).

SF 1 (Same as SD 1).

SG 1 (Same as SD 1).

SH 1 (Same as SD 1).

SI 1 (Same as SD 1).

SJ 1 (Same as SD 1).

SJ 12 Shut down test equipment. Hydraulic, air and electrical power must be terminated in proper sequence and all lines and cabling between test consoles and missiles removed.

SN 1 Make necessary electric cable connections between the missile component and the test consoles.

SO 2 (Same as SN 1).

SP 1 (Same as SN 1).

DA 2 Make electrical cable and pneumatic connections between missile components and test console.

TBT 1 Remove chassis from cabinet and make necessary electric cable connections.

TCT 1 (Same as TBT 1).

THT 2 Make necessary electric cable connections from test console to power sources.

TIT 2 Make electrical cable connections between the test console and the console test unit according to prescribed procedure.

TIT 4 Shut down test equipment and disconnect cabling.

RAE sub 1 Connect electrical cables between missile components and power source.

Category 7. Connecting and Disconnecting Microwave Fittings:

TA 5 Make necessary microwave, electric cable, and air hose connections between the missile and the test console.

TB 3 Make all pneumatic, hydraulic, microwave, and electric cable connections between the missile and the test console.

TB 12 Make necessary microwave, and electrical connections between missile, test panel, and radar beam simulator.

TC 1 Make necessary electrical cable and waveguide connections between the test consoles and the receiver. Connections should be made in proper sequence and according to prescribed procedures.

RC 5 Connect and disconnect rf cables, energize and deenergize relays, according to prescribed procedure while observing synchroscope output.

RF 2 Make specified electrical and microwave connections between control units and other missile components.

SA 2 Make necessary microwave, electric cable, hydraulic hose, and air hose connections between the missile components and test consoles.

SB 2 (Same as SA 2).

SO 1 Mount the missile tail section in a special test stand and connect output waveguides of the rf console to the missile antennae.

PA 1 Make necessary microwave electric cable connections between missile components and test consoles.

PA 15a Connect microwave equipment using rf cables and waveguides.

PC 1 (Same as PA 1).

TFT 1 Make necessary microwave connections between microwave source and test console.

TFT 6f Make microwave connections between radar beam simulator and receiver.

TGT 2 (Same as TFT 1).

TGT 9e Make microwave connections between rf signal source and receiver.

REE sub 4 Make electrical and microwave cable connections and set switches according to specified procedure to feed coded pulse signals to circuit inputs. Observe indication of signal lights.

Category 8. Making High Potential Voltage Checks or Insulation Breakdown Checks

SK 2 Connect high potential voltage leads from test panel between cable connector pins and ground in order to apply a dielectric breakdown test voltage to missile cables. An indication of current flow as read on a built-in meter indicates failure of insulation.

SL 2 (Same as SK 2).

SN 8 Connect high potential voltage leads from test panel to cable connector pins and ground in order to apply a dielectric breakdown test voltage to missile cables. An indication of current flow as read on a built-in meter indicates failure of insulation. Potential is impressed across test points through internal switching which is done according to a specified procedure.

PAT 9 Set up and use VTVM with multiplier probe to check high voltage supply.

Category 9. Making Mechanical and Electrical Adjustments of Synchros, Counters, and Gear Trains (in Shoran-type range systems)

RME 10 sub Set helipot limit switch operating point by loosening a mechanical coupling: Manually rotate a gear train; adjust and lock the position of a veeder-root counter and a helipot.

RNE 1 sub Slew a servo-motor gear train system by operating a switch until a veeder-root counter reads a desired value.

RME 6 sub Adjust the time delay of a pulse by manually rotating mechanical counter coupled to a synchro generator until the pulse is lined up with a desired marker, as displayed on a synchroscope. Determine if the counter reading corresponds to the specified pulse delay in miles.

RME 11 sub Adjust the pulse position and tracking relative to marker "comb," as monitored on a synchroscope, by adjusting potentiometers and gear trains, while reading veeder-root counters. Use specified external "sync" on scope.

RME 12 sub Rotate component resolver to adjust pulse position relate to a marker "comb" on synchroscope. Use specified external "sync" on scope.

RNE 2 sub Put "range" into a servo system by rotating a control transformer stator barrel (knob) according to specified procedure.

RNE 3 sub Turn a veeder-root counter knob, until a light is energized; then read counter.

RNE sub 5 Loosen clamping screws which position an autosyn stator barrel. Turn the stator barrel until minimum output voltage, as measured at test point with a standard VTVM, is obtained.

RNE sub 6 Turn a veeder-root counter knob until maximum voltage reading is obtained on a standard VTVM.

RNE sub 7 Use manual knob to set servo gear train into motion and visually check counter to determine whether servo amplifier follows without oscillation.

ROE sub 4 Adjust servo system gear trains by turning a knob until two veeder-root counter readings are similar.

ROE sub 10 Set a slewing switch and observe if gear trains move smoothly and without jumping.

Category 10. Manipulating Test Console Front-Panel Switches and Controls and Observing Go-No-Go Indicators:

TA 1 Turn power switch on, and warm up console. Visually check indicator lights.

TA 9 Set controls on test consoles and depress test start switch. Observe elapsed time meter and go-no-go indicators in the course of an automatically programmed test. At specified times manually rotate missile to prescribed roll altitudes. Record go-no-go indications.

TB 13 Set switches, adjust controls and warm up radar beam simulator. Adjust attenuators so that specified outputs, in db, are obtained at some remote point; involves simple arithmetic operations.

RF 15 Set switch to energize power source and check presence of voltage by observing tube filaments and listening for blower operation.

RF 9 Set a switch and observe prescribed warm-up time.

RK 5 Observe control surface motion and determine if it is in desired direction for proper operation.

RL 1 Set up and warm up test console. Switch on missile power and wait until prescribed warm-up period has elapsed before operating delay switch.

RO 5 Set controls as prescribed. Observe control surface movement.

RP 5 Disconnect rf signal to missile by disconnecting coaxial cable. Observe control surface movement.

RS 6 Make a control function test by operating the control panel at the Radio Command transmitter and visually inspect the response of the missile control surfaces and other controlled devices.

RS 9 Turn on Radio Command equipment and observe prescribed warm-up time.

RT 2 Set up test console by throwing switches to prescribed initial positions; turn on main power and wait for prescribed warm-up time; then check indicator lights for specified initial condition.

RU 5 Set up a test console by throwing switches to prescribed initial positions; turn on main power and observe warm-up time.

RU 6 Check operation of missile component by observing indicator lights on test console while push buttons or switches on missile control console are manipulated.

RV 1 Connect electrical and rf cables between test set control box and missile components. Terminate antenna connections with proper dummy loads. Turn on power and observe prescribed warm-up time.

RV 2 Execute missile commands by depressing push buttons on control and check system operation by observing indicator lamps on test set.

RX 5 Observe movement of engine throttle as throttle commands are executed at the Radio Command transmitter.

RX 7 Observe the action of wheel brake discs as commands are executed at the Radio Command transmitter.

RX 8 Listen for solenoid switch, value action or delay timer motor noise as commands are executed at the Radio Command transmitter.

SA 10 Visually inspect all test equipment controls for the correct initial starting positon. More than one hundred controls are checked.

SB 4 (Same as SA 10).

SC 4 Test missile component by manipulating test controls according to a specified procedure and observe indicating lamps for normal or abnormal indications.

SN 7 (Same as SC 4).

SP 2 Set controls and warm up test consoles. Throw switches to initial positions.

DA 4 Warm up test console and observe counter, re-setting manually if necessary. Throw switch to begin automatic test. Observe go-no-go indicator lights.

DA 5 Observe indicator lights and counter for location of fault.

DA 6 Shut down console by throwing the switch.

DA 7 Check for correct operation of test console by throwing switches to start automatic self test and observe indicator lights.

TBT 2 Turn on power and warm up equipment.

TBT 3 Set switches as prescribed and observe relay positions.

TCT 2 (Same as TBT 2).

SPT 3 Set reference and calibration voltages by making screwdriver adjustments to potentiometers for specified built-in meter readings, relay operations, and lamp indications. Switches and push buttons are thrown in specified sequence.

SQT 7 Throw switches and depress push buttons while observing indicator lights for proper operation.

Category 11. Operating Mechanical Test Equipment and Using Hand Tools:

a. Pressurize component housing

RL 2 Pressurize container with air at 5 psi.

RS 5 Reinstall unit in its cabinet and pressurize it to specified air pressure using a hand pump.

b. Wiring, using soldering iron and pliers

SE 14 Remove and replace resistors and capacitors in missile components using hand tools (soldering iron, etc.).

SF 11 Remove and replace resistors and capacitors in missile components using hand tools (soldering iron, etc.).

SG 6 (Same as SF 11).

SI 6 (Same as SF 11).

SJ 8 (Same as SF 11).

SKT 4 Remove and replace a standard resistor using hand tools.

c. Mechanical adjustments

RW 12 Start a stop watch as a switch is thrown and move tilt table to vertical position. Measure time required for missile control surface meters to come to zero.

RW 22 Adjust control surface dither signal amplitude by making screwdriver adjustment of potentiometer until proper amount of dither can be felt when control surfaces are touched.

SA 9 Adjust wing dither signal amplitude by making screwdriver adjustments on a potnetiometer until the proper amount of wing vibration is felt by hand.

SB 11 Recage a free gyro by manipulation of mechanical controls according to specified procedures.

SH 8 Recage a free gryo by manipulating wheels and levers of mechanical controls according to specified procedures.

SM 2 Use a standard dial indicator (center gage) to center wing hubs within specified tolerances.

SM 4 Manually relatch a spring loaded mechanism by manipulating a special rod through a hole provided for the purpose.

SM 5 Use a standard fish scale to measure spring tension in order to check the adjustment of an arming mechanism.

SM 8 Make adjustments to clearance gaps and motion limits of precision mechanisms using standard screwdrivers, wrenches, feeler gages, calipers and height gages.

SM 9 Remove and replace springs and other small parts of precision mechanisms using standard hand tools and special fixtures.

SM 11 Adjust a torsion spring for the proper time rate of motion of an actuating arm. Load the arm with test dead weights, actuate a release trigger and time arm movement with a standard stop watch. Adjust spring until time coincides with that specified on a chart.

PC 7b Adjust altitude reference compensator by performing mechanical (hand tool) adjustments in missile.

PE 1 Position and read level bubble and protractor settings in decalage gage. Set trim tabs in accordance with decalage gage readings.

PC 7a Adjust altitude reference compensator by front panel manipulation on test console.

DA 3 Secure arming wire loops to arming device latches on test console.

DF 1 Adjust total aileron movement with jam nut. Pin nut to piston rod.

DF 2 Adjust and lock aileron adjusting rod with groove pin so that ailerons move the same amount on either side of mechanical zero.

THT 8 Set up a Graham variable speed drive to drive a potentiometer and/or a servo generator at specified speeds of rotation.

TJT 2 Manually adjust a pressure limit switch for specified activating pressure.

SLT 11 Adjust the limit switch on a sine drive assembly by adjusting a set screw until the unit cuts out at specified maximum frequency.

RME sub 9 Adjust a thermostat's operation for a desired temperature range.

d. Mounting missile and missile components in stands and installing mechanical transducers

TA 2 Place missile in test stand in proper attitude. Connect missile exhaust to a muffler.

TA 3 Install control surface transducers in sockets. Inspect mating surfaces to make sure they are free from dirt or foreign particles.

TA 4 Set transducer protractor to servo zero: Insert control surface into socket opposite the transducer and manually rotate to each extreme position. Note protractor dial reading at each extreme and the midpoint. If necessary loosen zero adjustment and rotate transducer until zero coincides with midpoint.

TB 1 Inspect missile for proper assembly and evidence of injury of mishandling. Install, position, and electrically ground the missile in the missile test stand. Check switches for correct initial position. Check for jumpers between specified points. Check log for previous servicing.

TB 2 Install control surface protractors and mechanically zero indicators.

TC 9 Set up and use a vibration test stand to excite missile rec iver at a specified frequency and amplitude during a se ies of functional tests.

RF 1 Mount control units in missile framing.

RW 1 Make electrical cable connections between test bench and missile components. Mount gyro on special tilt table. Turn power ON and observe prescribed warm-up time.

RW 18 Disconnect autopilot gyros and substitute spare gyros mounted on tilt table.

RW 19 Install control surface protractors using specified procedure.

SA 1 Mount the missile control and power assemblies in the missile test stand.

SB 1 (Same as SA 1).

SH 2 Mount free gyro unit on a special test table using appropriate mounting adaptors and level the table before test.

SM 1 Mount missile component in special test stand; make hydraulic line and electric cable connections; and install special pipe plugs in specified hydraulic fittings.

DA 1 Mount and remove missile tail and nose components in test console.

PAT 2 Use 0-4500 rpm variable speed motor, tachometer, and tachometer indicator, to activate relay interlock circuits.

e. Calibrating and adjusting altitude sensing devices and pressure gages.

TB 4 Set up and use standard vacuum pump with associated gage, tubing, and missile pressure probe adaptor, so that missile high altitude operation may be simulated.

RW 8 Set up and use a special altitude simulator to check autopilot response to changes in missile altitude.

RW 10 Measure missile altitude control by adjusting the altitude simulator control and rotating the autopilot pitch gyro for null reading on a VTVM. For each gyro setting read the corresponding voltage at a specified test point using a standard multimeter.

SGT 4 Calibrate a vacuum gage using a mercury manometer.

SJT 1 Calibrate a bourdon pressure gage between limits of ± atmosphere using a mercury manometer.

Category 12. Performing Numerical Operations and Using Tables and Graphs:

a. Performing arithmetic and algebraic operations

TB 7 Compute system response parameters from recorded test data. The computations involve simple algebraic or arithmetic manipulation.

TC 6 (Same as TB 7).

TB 13 Set switches, adjust controls and warm up radar beam simulator. Adjust attenuators so that specified outputs, in db, are obtained at some remote point; involves simple arithmetic operations.

RE 9 Compute peak power by performing simple algebraic operations including logarithmic manipulations and use of duty cycle concept.

RJ 6 (Same as RE 9).

RN 5 Determine rate gain by performing simple arithmetic operations on known data.

RU 3 Compute receiver sensitivity from dial readings and cable parameters using simple arithmetic computations.

RW 13 Compute rate of missile "nose-over" from recorded test data using simple arithmetic computations.

SA 12 Read a voltage from a wing position potentiometer and translate to degrees of wing deflection by use of a multiplying factor which is given to three significant figures.

SA 14 (Same as TB 7).

SB 8 (Same as TB 7).

SE 9b Compute system response parameters from recorded test data. The computations involve simple algebraic or arithmetic manipulation, including use of logarithms.

PA 15c Perform algebraic operation to determine power level from meter reading, attenuator settings, and cable lengths.

PA 16 Add attenuator readings to obtain signal levels in db.

PA 18c Perform algebraic operation to determine power level from meter reading, attenuator settings, and cable lengths.

TFT 6e Subtract known calibration constant from attenuator setting to determine rf input power.

TFT 10 Use a synchroscope and special built-in discriminator to measure frequency pulling of rf source by setting and adjusting switches and controls, observing discriminator output on synchroscope, and multiplying peak to peak amplitude of this signal by a known calibration constant.

TGT 6 Apply an ac voltage of specified value to klystron repeller and use a built-in special discriminator in conjunction with a synchroscope and VTVM to determine a frequency pulling calibration constant. This procedure includes setting switches and controls, building a simple R-C network for voltage dividing and coupling purposes, and performing simple arithmetic computations.

THT 7a Compute phase angle between two signals from measurements of the displacement of the signal peaks.

TKT 4a Compute circuit impedance from recorded test data. The computations involve simple algebraic or arithmetic manipulation.

SFT 19 Calibrate an attenuator using a battery as input voltage source and a high impedance, accurate voltmeter as an output voltage indicator. Calculate the voltage attenuation for each set of readings and compare with control knob calibrations.

SKT 2 Check amplifier gain using a calibrated test input signal and reading the amplifier output on built-in meters. Compute voltage gain.

SPT 4 Make simple arithmetic computations to determine reference voltage settings.

RIE 4 sub Compute output voltage by performing simple algebraic operations including logarithms.

RLE 5 sub Compute power supply regulation and output resistance from test data using simple algebraic formulae.

RIE 11 sub Compute peak power by performing simple algebraic operations including logarithmic manipulations and use of duty cycle concept.

RLE sub 7 Measure power supply output voltage at specified load, as input voltage is changed with autotransformer. Calculate per cent change of output voltage.

ROE sub 9 Calculate the velocity error of a tracking unit by synchronizing and locking servo gear trains, manually adjusting gear train counter readings, reading voltages, and performing a prescribed procedure including simple arithmetic operations.

b. Using and constructing tables and graphs

RE 8 Use charts or nomographs to transform test data.

RT 5 (Same as RE 8).

RM 4 Plot input and output voltages for various switch settings to obtain family of gain curves. Compare obtained curves with prescribed curves.

RN 6 Plot rate gain for various switch settings to obtain rate gain graph. Compare obtained curves with prescribed curves.

RS 3 (Same as RE 8).

RW 11 Plot recorded test data on standard coordinate paper, construct and measure the slopes of the curves.

RW 21 Plot test data on rectangular coordinate paper and construct and find slopes of curves.

SA 4d (Same as RE 8).

SB 12d (Same as RE 8).

SO 5d (Same as RE 8).

SO 9 Adjust standard microwave power attenuators by setting control knobs to prescribed positions read from a graph.

PD 2 Use graph to determine appropriate receiver output voltage.

RIE sub 10 (Same as RE 8).

Category 13. Reading Schematic and Wiring Diagrams to Locate Test Points:

RW 7 Read wiring and/or schematic diagrams to determine location of test points within missile components.

SD 9 Read wiring and schematic diagrams to locate test points to which standard test instruments shall be connected.

SE 16 (Same as SD 9).

SF 9 (Same as SD 9).

SH 7 (Same as SD 9).

SJ 10 (Same as SD 9).

SK 3 (Same as SD 9).

SL 3 (Same as SD 9).

SO 12 (Same as SD 9).

Category 14. Servicing and Adjusting Relays:

RW 9 Actuate relays by applying a dc voltage to specified terminals and connector strips.

TAT 3 Adjust time delay relay for specified delay at normal operating temperature.

TJT 4 Adjust a sensitive polarized dc relay for proper minimum activating voltage by adjusting relay contacts with pliers. Successive adjustments must be made until activating voltage, as measured with a VTVM, is within specified limits.

SET 1 Visually check relay action between specified voltage limits after energizing dc relays with a variable voltage source.

SPT 1 Visually inspect all relay contacts for signs of pitting. Dress contacts or replace relays if necessary.

SPT 2 Use a standard stop watch to measure the time delay of time delay relays. Make mechanical adjustment (screwdriver) if necessary to adjust relays to specified time delays.

PAT 5 Service relays to correct poor contacts, open coils, and frozen contacts, using ohmmeter and simple hand tools.

PAT 6 Fire thyratron switch tube (by eliminating bias) to check thyratron and associated relay operation check.

RLE 6 sub Measure minimum dc relay activating voltage, using standard VTVM. This is accomplished by increasing supply voltage until relay is observed to close. If necessary adjust screw on relay armature.

RLE 11 sub — Perform screwdriver adjustments of the voltage at which a relay operates.

RNE 4 sub — Remove a relay cover and force relay contacts into desired position. After performing prescribed operations observe relay contact position and if necessary perform potentiometer adjustment.

RNE 9 sub — Remove a relay cover and insulate the stationary contact from the movable contact with pieces of cardboard.

ROE 3 sub — Remove a relay cover and determine the position of contacts.

Category 15. Setting Up, Using and Calibrating Frequency Meters:

a. Heterodyne frequency meters

RB 1 — Set up and use microwave heterodyne frequency meter to measure frequency of signal source.

RB 2 — Calibrate a heterodyne frequency meter by zero-beating against an internal crystal oscillator.

RE 4 — (Same as RB 2).

RE 5 — Calibrate an absorption type frequency meter and a microwave spectrum analyzer (klystron oscillator) against an external frequency standard.

RU 9 — Set up and use a standard rf frequency meter to tune a radar receiver to prescribed frequency.

RU 11 — Set up and use a secondary standard frequency meter to calibrate a standard rf frequency meter.

TCT 5 — Check AFC operation by using heterodyne frequency meter in test unit to measure difference frequency. If necessary adjust coil tuning slug position until specified frequency is obtained. Set controls and switches to prescribed positions.

TGT 7 — Calibrate a test console FM deviation meter by applying an externally generated pulse signal of specified FM deviation, pulse amplitude and width to jack; perform screwdriver potentiometer adjustment until prescribed meter reading is obtained.

RIE 5 sub — Calibrate a heterodyne frequency meter by zero-beating its output against an internal crystal oscillator signal.

b. Absorption type frequency meter

RE 5 Calibrate an absorption type frequency meter and a microwave spectrum analyzer (klystron oscillator) against an external frequency standard.

RU 10 Set up and use a standard rf frequency meter to tune a radar transmitter to prescribed frequency.

SA 4b Use a coaxial frequency meter, a wattmeter bridge, and bias supply meters to determine correct adjustments for tuning a klystron oscillator.

SB 12b (Same as SA 4b).

SO 5b (Same as SA 4b).

TFT 6a Check that radar receiver is tuned to frequency of signal source.

TFT 9 Use a built-in absorption type frequency meter to measure frequency of microwave signal.

RIE 6 sub (Same as RE 5).

c. EPUT meter

SE 4 Set up and use a standard EPUT meter for measuring signal frequency.

SE 17 Adjust oscillator frequency by adjusting capcaitor decade box until desired frequency is indicated by EPUT meter.

SG 2 (Same as SE 4).

SMT 6 Set up and use a standard EPUT meter to measure the frequency of an af oscillator.

SLT 6 (Same as SMT 6).

SNT 6 (Same as SMT 6).

SOT 6 (Same as SMT 6).

Category 16. Setting Up and Using a Special Servo Analyzer:

RU 14 Set up and use a special servo analyzer to make frequency response checks of an auto pilot.

RW 17 Make frequency response check of an auto pilot using a servo analyzer to generate the input signal which is varied in frequency and attenuated to keep the output signal constant in magnitude. The magnitude of the output signal is measured with an oscilloscope and the phase shift with the analyzer phase meter.

Category 17. Setting Up and Using Oscillographic Recorders:

TA 6 Set up and use multi-channel recording oscillograph to record signals: Manually position transducers to specified angular positions, and adjust recorder gain so that prescribed pen deflection is obtained.

TA 7 Set up a multi-channel pen recorder. Zero pens.

TA 8 Interpret oscillograph recordings to determine cause of control system malfunctioning.

TB 11 Set up and use a single channel recording oscillograph to monitor af signals.

TB 11a Set up, voltage calibrate, and use a single channel recording oscillograph to determine rate of wing motion.

TB 11b Use a single channel recording oscillograph to measure frequency of an af signal.

TC 7 Set up and use a multi-channel recording oscillograph to monitor transient signals. Determine the system response from the test records.

RQ 5 Set up and use standard multi-channel oscillograph to obtain record of voltages which appear at designated circuit points when rf input to missile is disconnected by disconnecting coaxial cable.

SA 16 Set up and use a multi-channel recording oscillograph to record wing positions during control system test. Each channel must be calibrated (using internal calibration circuit) and all pens zeroed prior to time of test.

SB 6 (Same as SA 16).

SB 10 Use a multi-channel recording oscillograph to monitor continuous signals. Compute system gain and phase angle between two signals from measurements on test records. In computing gain, frequency response of test equipment components must be accounted for. The computations involve simple algebraic or arithmetic manipulation.

SE 9 Set up and use a multi-channel pen recorder to record report and output signals. Calibrate each channel using internal calibrating circuits, and zero all pens used.

Se 9a Use a multi-channel recording oscillograph to monitor continuous signals. Compute system gain and phase angle between two signals from measurements on test records. In computing gain, frequency response of test equipment components must be accounted for.

SH 6 Set up and use a multi-channel pen recorder to record output signals. Calibrate each channel using internal calibrating circuits, and zero all pens used.

SI 5 (Same as SH 6).

SJ 4 (Same as SH 6).

THT 9 Set up and use a standard built-in pen recording oscillograph for monitoring ac and dc signals.

SLT 8 Set up and use a standard pen recorder to measure a dc voltage.

Category 18. Set Up and Use Standard and Special Signal Generators:

a. RF generators

RB 7 Set up and use a standard microwave signal generator.

RC 2 (Same as RB 7).

RD 1 (Same as RB 7).

RG 1 (Same as RB 7).

RL 4 (Same as RB 7).

RK 1 (Same as RB 7).

RO 1 (Same as RB 7).

RP 1 (Same as RB 7).

RQ 1 (Same as RB 7).

RR 3 Set up and use rf signal generator and VTVM for signal to noise ratio tests.

RR 4 Set up and use a VTVM and an rf signal generator with prescribed modulation, for signal to noise ratio tests.

RR 5 Set up and use rf signal generator, and VTVM to determine the magnitude of rf input to saturate receiver limiters.

RS 7 Set up and use a standard rf signal generator to supply test signals to radio receiver. Read the input level at which a prescribed receiver output is obtained.

RU 2 Set up and use a standard rf signal generator and a crystal current meter to check the sensitivity of a radar receiver. A dummy antenna load must be connected prior to this test.

PA 15b Use standard microwave generator to determine radar transmitter frequency by heterodyne action.

PA 17a Use standard microwave signal generator to simulate radar target echo signal.

PA 18a Use standard microwave generator to measure sensitivity.

PA 19a Use standard microwave signal generator to simulate moving target.

TCT 3 Connect signal generator, and VTVM to specified points within chassis signal generator cable with specified resistor.

RBE sub 3 Set up and use a standard microwave signal generator.

RCE sub 1 (Same as RBE sub 3).

RDE sub 1 (Same as RBE sub 3).

REE sub 1 (Same as RBE sub 3).

RJE sub 6 (Same as RBE sub 3).

b. Audio frequency generators

SB 9b Set up and use a standard audio oscillator as test signal source.

SE 8 (Same as SB 9).

PA 9 Set up and use a standard audio generator for Z - axis modulation of synchroscope.

TKT 6 Set up and use a standard af signal generator and VTVM to adjust an af reference signal voltage. Make adjustment by varying a potentiometer for specified voltage indicated on a VTVM.

SIT 2a Use audio oscillator and VTVM to determine frequency response.

SMT 11 Set up and use a standard af oscillator as a test signal generator.

SNT 11 Set up and use a standard af oscillator as a test signal generator.

SNT 12 Use a standard af signal generator and a standard multimeter to adjust the phase shift of a demodulator. Change the setting of a trimmer capacitor (screwdriver) until the voltage read on the multimeter goes through a maximum value.

RKE 3 sub Set up and use an audio generator as an accurately calibrated horizontal sweep voltage for synchroscope.

c. Pulse generators

RB 8 Set up and use standard pulse generator for triggering purposes.

RB 10 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RB 11 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RC 3 (Same as RB 10).

RC 4 (Same as RB 11).

RD 2 (Same as RB 10).

RD 3 (Same as RB 11).

RE 2 (Same as RB 10).

RF 8 (Same as RB 10).

RG 2 (Same as RB 10).

RG 3 (Same as RB 11).

RJ 1 (Same as RB 10).

RK 2 (Same as RB 10).

RK 3 (Same as RB 11).

RL 5 (Same as RB 10).

RL 6 (Same as RB 11).

RO 2 (Same as RB 10).

RO 3 (Same as RB 11).

RP 2 (Same as RB 10).

RP 3 (Same as RB 11).

RQ 2 (Same as RB 10).

RQ 3 (Same as RB 11).

SA 6 Adjust a special pulse generator for output pulses of required level, magnitude, stability, and shape. Adjustments involve potentiometer control knobs which are set for prescribed meter readings and correct output wave shapes.

SB 14 Adjust a special pulse generator for output pulses of required magnitude, stability, and shape. Adjustments involve potentiometer control knobs which are set for prescribed meter readings and correct output wave shapes.

SD 4 (Same as SA 6).

SO 7 (Same as SA 6).

SBT 4 Set up and adjust a standard pulse generator for output pulses of specified width, frequency and amplitude as viewed on an oscilloscope.

SFT 2 Align a pulse generator according to specified procedure. A step-by-step procedure must be used and correct sequence of operations is very critical.

RBE sub 4 Set up and use a special dual channel video pulse generator for triggering a pulse signal generator.

RBE sub 5 Set up and use a special coded video pulse pair generator for triggering a microwave signal generator (only one front panel control involved).

RCE sub 2 (Same as RBE sub 4).

RCE sub 3 (Same as RBE sub 5).

RDE sub 2 (Same as RBE sub 4).

RDE sub 3 (Same as RBE sub 5).

REE sub 2 (Same as PBE sub 4).

REE sub 3 (Same as RBE sub 5).

RIE sub 2 (Same as RBE sub 4).

RJE sub 7 (Same as RBE sub 4).

RKE sub 2 (Same as RBE sub 4).

RME 4 Calibrate a special marker generator by adjusting potentiometers until markers and pulses appearing on a synchroscope have desired spacing and position.

d. Rf attenuators

SA 8 Adjust standard microwave power attenuators by setting control knobs to prescribed positions read from graph.

SO 9 (Same as SA 8).

SB 16 (Same as SA 8).

TFT 6d Adjust built-in rf attenuator until specified if output is obtained as read on a built-in VTVM.

TGT 9d (Same as TFT 6d).

Category 19. Testing and Adjusting Free and Rate Gyros:

SH 3 Set up and use a sine-drive table for vibration of a gyro unit during maintenance check.

SI 4 Mount rate gyro unit in special pendulum test fixture and use pendulum according to prescribed procedure for acceleration testing of unit.

SI 7 Adjust a rate gyro for sensitivity and dynamic balance. The adjustment involves screwdriver adjustments of magnetic circuit air gaps using a pen recorder as indicating instrument. The gyro is accelerated by a Pendulum Test Fixture.

Category 20. Timing with Stopwatches:

TC 8 Use a stop watch to determine delay times by timing the period between the manual switch actuation and relay contacts closing.

RN 2 Use stop watch to determine time required for voltage, as indicated on built-in meter, to go from maximum to minimum.

RT 5 Use a stop watch to time the period of application of control function (throwing switch).

RW 5 Use a stop watch to measure the turning rate of a control synchro.

RW 12 Start a stop watch as a switch is thrown and move tilt table to vertical position. Measure time required for missile control surface meters to come to zero.

PA 19b Use stop watch to time sequence of signal application and removal.

THT 3 Use a standard stop watch to calibrate an elapsed time meter.

SCT 1 Measure the time delay interval with a standard stop watch after actuation of a time delay relay.

SCT 2 Use an accurate chronograph to check the calibration of an elapsed time meter.

SFT 16 Use a stop watch to time delay interval of a relay. Set relay for proper delay interval by mechanically adjusting delay control.

SHT 3 (Same as SET 2).

SHT 4 (Same as SFT 16).

SQT 3 Calibrate an elapsed time meter using a standard stop watch.

SQT 6 Use a standard stop watch to measure the delay interval of a time delay relay.

SPT 2 Use a standard stop watch to measure the time delay of time relays. Make mechanical adjustment (screwdriver) if necessary to adjust relays to specified time delays.

Category 21. Using and Calibrating Simple Meters to Measure Voltage, Current, and Resistance:

RA 2 Use standard voltmeters to measure voltages at test points. Determine if measured voltages are within 5% of specified values.

RB 3 Use external crystal detector and milliameter to measure high frequency current.

RD 4 Use a standard voltmeter to measure voltage available at test point after connecting test load resistor.

RF 4 Use a multimeter to make continuity checks.

RF 6 Use a standard voltmeter to measure voltages appearing at test points.

RF 7 Use a standard milliameter to measure current at test point.

RF 10 Use a calibrated microammeter to read current.

RF 12 Calibrate a microammeter by determining necessary series calibrating resistance; use ammeters, potentiometers, and battery connected to test points as specified; measure resistance value with ohmmeter.

RK 4 Use a standard voltmeter to measure the voltage available at a test point after connecting a test load resistor.

RM 3 Set up and use standard VTVM to measure output voltage for switch positions.

RN 3 Use built-in voltmeter to determine maximum and minimum values of a slowly varying voltage.

RN 4 Set up and use standard VTVM to measure ac output voltage.

RR 3 Set up and use rf signal generator and VTVM for signal to noise ratio tests.

RR 4 Set up and use a VTVM and an rf signal generator with prescribed modulation, for signal to noise ratio tests.

RR 5 Set up and use rf signal generator, and VTVM to determine rf input to saturate receiver limiters.

RS 2 Set up and use a VTVM and a standard multimeter to measure voltages appearing at designated test points.

RS 8 Set up and use a VTVM to measure voltages appearing at designated test points. Before connecting meter, shunt the test connectors with a damping resistor of prescribed value.

RS 10 Set up and use a standard VTVM to measure voltages at specified test points.

RT 4 Set up and use a standard VTVM to measure voltages at designated test points.

RU 7 Set up and use a standard ac VTVM to check voltages appearing at designated test points.

RW 4 (Same as RS 10).

RW 6 Check wiring continuity of missile components with standard ohmmeter using terminal strips and cable connectors.

RX 9 Measure voltages at specified test points with a multimeter as commands are executed at the Radio Command transmitter.

SB 7 Set up and use a standard VTVM for ac voltage measurements.

SC 1 Use a standard multimeter for checking circuit continuity and/or circuit resistance values. Record values and compare with normal values specified.

SD 5 (Same as SB 7).

SE 6 Set up and use a standard VTVM for measuring voltage at specified test points.

SE 7 Set up and use standard multimeter for making voltage measurements.

SF 3 (Same as SE 7).

SF 4 (Same as SC 1).

SF 6 (Same as SB 7).

SG 4 (Same as SB 7).

SJ 5 (Same as SB 7).

SJ 9 Set up and use a standard Kelvin Bridge ohmmeter for making precise resistance measurements.

SJ 11 (Same as SC 1).

SK 1 (Same as SC 1).

SL 1 (Same as SC 1).

SN 4 (Same as SB 7).

SN 5 (Same as SJ 9).

SO 10 (Same as SC 1).

PA 3 Use a standard VTVM to measure dc voltage appearing at test points.

PB 1 Perform continuity checks from junction box terminals to specified test points using wiring diagram and multimeter.

PA 12 Use a standard ammeter to read magnetron current available at test point.

DB 1 Adjust carbon pile regulator by adjusting rheostat, magnetic core position, and pile pressure screw until output voltage and regulation are as specified.

DB 2 Adjust and lock magnetic core with generator running at specified speed and load so that rheostat can control voltage between specified limits.

DC 1 Adjust carbon pile regulator by adjusting magnetic core position and pile pressure screw so that regulation is as specified.

DC 2 Adjust carbon pile core screw for prescribed no load output voltage. Rheostat should be at specified setting.

DD 1 Adjust potentiometer for specified output voltage on external voltmeter.

DE 1 Adjust AGC delay potentiometer for specified voltage at test point as measured by VTVM. Set up and use audio oscillator and microvolter to furnish specified input signal.

TAT 1 Use ohmmeter to measure resistance to ground at specified test points within the chassis. Compare with prescribed values.

TAT 2 Connect and use variac to adjust line voltage.

TFT 7 Set up and use a direct reading, built-in VTVM for measuring PRF, and FM deviation of input signal.

TFT 11 Measure FM phase of microwave signal with respect to beam nutation by setting and adjusting switches and controls, reading a built-in VTVM, using specially prepared tables and a specified procedure.

TKT 1 Use a standard multimeter for checking circuit contunity.

TKT 9 Calibrate built-in ac VTVM's. Set up and use a standard audio oscillator or dc laboratory power supply as voltage source. Adjust calibrating potentiometer (screwdriver) until VTVM reading is the same as the input voltage as indicated on a known accurate voltmeter.

SAT 1 Connect a Millivac meter to specified test points and read output voltage.

SAT 7 Calibrate a built-in VTVM using another VTVM and an audio oscillator according to specified procedure.

SET 3 Use a variable voltage source and a known accurate voltmeter to check, calibrate, and zero a voltmeter.

SET 4 Warm up and "zero" a vacuum tube voltmeter; calibrate each ac and dc voltage range with variable voltage sources and known accurate voltmeters.

SET 5 Use a multimeter to check the range of output voltage adjustment possible by varying a front panel control.

SET 6 Use a multimeter to check circuit resistance and wiring continuity.

SFT 1 Use a variable voltage source and a known accurate voltmeter to check, calibrate, and zero a voltmeter.

SFT 3 Set up and use a VTVM to check dc operating voltages of an electronic circuit and compare with specified values. Tolerance is ten per cent of specified voltages.

SGT 1 (Same as SET 6).

SGT 2 (Same as SFT 1).

SHT 1 (Same as SFT 1).

SHT 2 (Same as SET 6).

SIT 4 Set up and use a sensitive VTVM to check the ripple voltage output of a demodulator.

SKT 6 Set up and use a VTVM for checking output level of af oscillators.

SQT 1 Calibrate all panel meters with a variable voltage supply and a known accurate two per cent voltmeter.

SQT 2 Set up and use a VTVM to measure voltages at test points. Compare values with specified voltages.

SQT 4 Use a multimeter to check circuit continuity and resistance values which are compared with specified resistance.

SQT 5 Use a VTVM to measure the ripple voltage at the output of a power supply.

SQT 8 Use a multimeter to measure power supply output voltages after specified loads are set on a power resistance decade box.

SQT 9 Use a multimeter to read voltages at test points and compare values with specified voltages.

SMT 1 Check and calibrate if necessary all voltmeters and VTVM's using a known accurate 0.25 per cent voltmeter.

SMT 10 Check an amplifier gain by applying an af signal of specified voltage to the input terminals and reading the output voltage on a standard VTVM.

SNT 1 Check and calibrate if necessary all voltmeters and VTVM's using a known accurate 0.25 per cent voltmeter.

SNT 8 Measure a dc voltage at test points with a standard multimeter. If the voltage is not as specified vary a potentiometer setting until voltage is correct.

SNT 10 Use a standard multimeter to read voltages as specified test points. Compare readings with specified values.

SOT 1 Calibrate voltmeters with a known accurate 0.5% voltmeter and a dc power supply.

PAT 3 Use variable dc voltage source to apply test voltage in junction box with a multimeter.

PAT 7 Use multimeter to check tube filament voltage.

PAT 8 Use multimeter to check dc supply voltage.

RAE sub 2 Set up and use VTVM to measure voltages at specified test points.

RBE sub 1 Use built-in meters to measure current and voltage.

RCE sub 5 Set up and use a built-in VTVM to measure voltages.

RJE sub 1 Use a standard voltmeter to measure voltages appearing at test points.

RJE sub 2 Use a built-in meter to measure current.

RLE sub 3 Set up and use a VTVM for dc voltage measurement.

RNE sub 8 Set up and use a VTVM to measure the voltage available at test point.

RNE sub 10 Manipulate a potentiometer to determine whether output voltage as measured at test point with standard VTVM, is a minimum.

ROE sub 6 (Same as RNE sub 8).

ROE sub 8 (Same as RNE sub 8).

Category 22. Using Capacitor and Resistor Decade Boxes for Tuning and Aligning Electronic Circuits by Component Substitution:

SE 12 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method to adjust oscillator output amplifier and to balance modulator and amplifier.

SE 13 Set up and use a standard capacitance decade box for determining required circuit capacitance by the substitution method to adjust oscillator frequency and to balance modulator and amplifier.

SE 19 Adjust the cut-off frequency of a low pass filter by adjusting a pair of decade capacitances for specified voltages as read on a VTVM connected to test points.

SF 10 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method for adjusting amplifier gain and limiter limits.

SG 7 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method to adjust dynamic gain and balance of amplifier and to correct static balance of amplifier.

SI 8 Tune the rotor winding of a gyro pick-off synchro by adjusting a capacitance decade box for a specified voltage as read on a built-in voltmeter.

SJ 7 Set up and use a standard resistance decade box for determining required circuit resistance by the substitution method to adjust regulated power supply output.

SAT 8 Tune Wein bridge oscillator by changing fixed tuning capacitors. When required values are found install permanently.

SFT 14 Tune an af band pass filter by replacing filter capacitors to obtain a maximum output signal from the filter at a specified frequency. Measure signal output with a VTVM using a standard sine-wave generator as input signal source.

Category 23. Using Synchroscopes and Oscilloscopes:

TB 10 Set up and use a standard oscilloscope for monitoring af signals.

TC 4 Set up and use a standard oscilloscope to determine the phase relationships between two af signals.

TC 4a Interpret Lissajous figures as viewed on an oscilloscope screen in terms of the phase angle between two signals.

RB 4 Set up and use a synchroscope for monitoring a video signal.

RB 12 Set up and use a synchroscope to measure signal to noise ratio.

RB 13 Set up and use a synchroscope to measure pulse widths.

RC 1 Set up and use a synchroscope to monitor and determine frequency of a pulse source.

RD 5 Set up and use a synchroscope to monitor pulse signals.

RD 6 Set up and use a synchroscope to monitor the coincidence of two pulse groups. Adjust delay by turning knob until coincidence occurs.

RE 3 Set up and use a synchroscope to monitor and measure pulse amplitude, width, and spacing.

RG 4 Set up and use a synchroscope to compute signal to noise ratio.

RJ 2 (Same as RE 3).

RL 3 Set up and use a synchroscope to monitor and determine frequency of a low frequency pulse source.

RL 7 (Same as RD 6).

RO 4 Set controls as prescribed. Set up and use standard oscilloscope to monitor ac signal.

RP 4 Set up and use standard oscilloscope to monitor ac signal. Observe signal on scope while removing rf input to missile by disconnecting coaxial cable.

RQ 4 (Same as RP 4).

RW 15 Set up and use a standard oscilloscope to make frequency response checks of an auto pilot.

RW 16 Use a standard voltmeter to voltage calibrate an oscilloscope.

SA 5 Set up and use a standard synchro-oscilloscope for monitoring microwave pulses.

SB 9 Determine phase relationship between two signals.

SB 9a Set up and use a standard oscilloscope.

SB 9c Interpret Lissajous figures as received on oscilloscope screen, in terms of phase angle between two signals.

SB 13 Set up and use a standard synchro-oscilloscope for monitoring microwave pulses.

SB 17 Set up and use a standard oscillo-synchroscope for pulse monitoring. Accurately sketch pulse shapes. Compute pulse shape parameters by measuring pulse, height and width. Simple arithmetic and algebraic manipulations are involved.

SD 3 (Same as SB 13).

SD 7 (Same as SB 17).

SD 8 Set up and use an oscillo-synchroscope for measuring voltages of microwave pulses. Calibrate scope for voltage, using an internal calibrating circuit.

SE 3 Set up and use a standard oscilloscope for monitoring continuous wave signals.

SE 5 (Same as SB 9).

SE 5a (Same as SB 9a).

SE 5b (Same as SB 9c).

SE 20 Correct an audio amplifier for phase shift by adjusting a decade capacitance for a specified Lissajous pattern as viewed on an oscilloscope.

SF 7 (Same as SB 9).

SF 7a (Same as SB 9a).

SF 7b (Same as SB 9c).

SF 8 (Same as SE 3).

SM 6 Manipulate test console controls to test missile component according to a specified procedure and observe oscilloscope to determine necessary adjustments.

SM 7 (Same as SE 3).

SO 6 (Same as SB 13).

SO 11 (Same as SD 8).

PA 8 Set up and use a synchroscope to measure frequency by Z-axis modulation.

PA 14b Use special test console oscillcscope to observe pulse wave forms.

PA 18b Use special test console oscilloscope to observe signal and noise during a receiver sensitivity check.

PA 19c Use special test console oscilloscope to observe pulse coincidence.

PA 21 Set up and use synchroscope to measure pulse spacing.

PA 22 Adjust time delay by performing screwdriver adjustment of potentiometer while pulses are viewed on synchroscope.

DE 2 Set up and use a standard oscilloscope.

DE 3 Adjust horizontal and vertical channel potentiometers so that specified input signals give specified output as indicated by observing a direct-coupled oscilloscope.

TAT 4 Set up and use standard oscilloscope to monitor power supply output and determine presence of undesired oscillations. Use series blocking capacitor for high voltage isolation.

TAT 7 Set up and use standard oscilloscope to measure power supply output ripple voltage.

TBT 4 Set up and use synchroscope with a high frequency probe to monitor pulse wave forms. Compare waveforms obtained with descriptions or photographs in manual. If necessary perform potentiometer (screwdriver) adjustment.

TFT 3 Set up and adjust synchroscope sweep lengths (marker intervals) by performing screwdriver adjustment of tuning capacitors.

TFT 4 Set up and use synchroscope to measure separation between pulses and pulse groups.

TFT 5 Set up and use synchroscope to observe pulse shape, jitter, and amplitude variations from pulse to pulse.

TFT 8 Set up and use a synchroscope, and built-in rf attenuator to determine modulation, in db, of input signal by determining db difference between modulation peaks and valleys.

THT 5 Set up and use a standard built-in oscilloscope to monitor ac and dc steady state signals.

THT 6 Set up and use a standard oscilloscope to determine the phase angle between two af signals.

THT 6a Interpret Lissajous figures as viewed on an oscilloscope screen in terms of phase angle between two signals.

THT 7 Set up and use a dual-beam oscilloscope or a standard oscilloscope with an electronic switch to determine the phase angle between two af signals.

TKT 7 Use a standard af signal generator and a standard oscilloscope to calibrate a phase shifting network.

TKT 8 Interpret Lissajous figures as viewed on an oscilloscope screen in terms of phase difference between the two signals.

SAT 6 Set up and use an audio oscillator and an oscilloscope to determine the frequency of an af test signal.

SAT 6a Interpret Lissajous figures in terms of frequency of test signal.

SBT 2 Set up and use a standard oscilloscope for viewing microwave pulses and measuring pulse amplitude.

SBT 3 Calibrate an oscilloscope for voltage measurement using an internal calibrating circuit.

SBT 5 Adjust a blocking oscillator cathode bias (screwdriver adjustment of potentiometer) for clean reliable output pulses. The oscillator is driven with an external pulse generator and the output is viewed with an oscilloscope.

SDT 1 Set up and use two oscilloscopes to compare the phase angle between two 50 cycle per second modulated rf signals.

SDT 2 Set up and use an oscilloscope to view a signal modulated pulse and adjust the pulse modulator for specified per cent modulation.

SDT 2a Compute the per cent modulation of a modulated pulse by comparing modulated area to the unmodulated area of the pulse as viewed on an oscilloscope.

SET 8a Set up and use an audio oscillator as a test signal source. Apply a signal of specified amplitude to an af amplifier. Set up and connect a VTVM and an oscilloscope to the output terminals of the amplifier to monitor the output signal. Observe the output signal for amplitude and presence of distortion at maximum setting of amplifier gain potentiometer.

SFT 6 (Same as SAT 6).

SFT 7 Set up and use an oscilloscope to check the operation of a counting circuit by comparing the number of pulses viewed at specified test points in the circuit.

SFT 8 Check the amplitude and width of microwave pulses using an oscilloscope and a VTVM.

SFT 9 Align a multivibrator circuit to obtain output pulses of specified width. Pulse width is varied by making potentiometer (screwdriver) adjustment while observing an oscilloscope.

SFT 11 Set up and calibrate an oscilloscope for frequency using an external frequency standard. Use the oscilloscope for checking pulse spacing sequence.

SFT 18 Check a calibrated voltage attenuator for circuit linearity. Apply microwave pulses to the input terminals and view the output pulses on an oscilloscope. Note any changes in waveslope, amplitude, or pulse rise time. Repeat test for each attenuator control position.

SIT 3 Measure the phase angle between two af signals using an oscilloscope.

SIT 3a Interpret Lissajous figures as viewed on an oscilloscope in terms of the phase angle between two signals.

PAT 1 Set up and use a dual gun, linear sweep, and a single gun, circular sweep, oscilloscopes. Set-up involves performing potentiometer (screwdriver) adjustments according to specified procedure.

PAT 10 Set up and use standard oscillo-synchroscope to monitor wave forms appearing at test points and within the chassis. Compare actual waveforms with pictures of normal waveforms for amplitude and shape.

RBE 6 sub Set up and use a synchroscope to measure receiver signal to noise ratio.

RCE 4 sub Set up and use a synchroscope to monitor pulses and to measure pulse amplitude.

RCE 6 sub Set up and use a synchroscope to monitor coincidence of two pulse groups. Adjust delay by turning knob until coincidence occurs.

RCE 7 sub Adjust potentiometers (screwdriver) so that waveforms viewed on a synchroscope have desired peak to peak amplitude, and slope.

RDE 4 sub Set up and use a synchroscope to monitor and measure pulse amplitude, repetition rate, width and spacing.

RIE 3 sub Set up and use a synchroscope to monitor microwave pulses and measure pulse width, amplitude, and spacing.

RJE 5 sub Determine oscilloscope probe multiplying factor, using internal calibrating voltage.

RJE 8 sub — Set up and use a synchroscope to monitor and measure pulse width and amplitude.

RKE 1 sub — Determine oscilloscope probe multiplying factor, using internal calibrating voltage.

RKE 4 sub — Set up and use a synchroscope to measure pulse amplitude, width, rise time, and spacing.

RKE 5 sub — Set up and use a synchroscope to determine low frequency PRF by using an externally calibrated sweep and observing the number of pulses.

RME 1 sub — Voltage calibrate a synchroscope using an internal calibrating circuit.

RME 2 sub — (Same as RKE 1 sub).

RME 3 sub — Set up and use a synchroscope to monitor pulse waveforms.

RME 5 sub — Use a synchroscope to compare the frequency of two non-sinusoidal signals by applying one to the signal input terminals and other to the external "sync" terminals and observing if stable pattern is obtained.

ROE 5 sub — Set up and use a synchroscope to monitor pulse waveshapes from the Range Tracker. If necessary adjust a potentiometer to obtain desired waveshape.

ROE 7 sub — Set up and use a synchroscope in conjunction with a pedestal generator to determine if a tracking pulse remains within pedestal limits, and at the same time inspect a relay for correct contact position.

RLE 10 sub — Set up and use an oscilloscope to monitor power supply ripple voltage.

APPENDIX D

HANDLING, ASSEMBLY AND SERVICING: GENERAL TASKS AND ASSOCIATED BEHAVIOR STATEMENTS, MISSILES CONSIDERED SEPARATELY

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HANDLING, ASSEMBLY AND SERVICING: GENERAL TASKS AND ASSOCIATED BEHAVIOR STATEMENTS, MISSILE CONSIDERED SEPARATELY

General Task TA--Handling and Transfer

TA 1 Assembling and disassembling missile containers with a pneumatic wrench and special hand tools.

TA 2 Attaching slings and sling lifting attachments to a missile, missile sections or missile containers by hand and with hand tools.

TA 3 Bleeding low pressure air from missile containers by releasing Shraeder valves.

TA 4 Lifting and carrying missile sections and missile containers by hand.

TA 5 Attaching grounding wires to missile sections and containers for safety during handling.

TA 6 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws.

TA 7 Inspecting the position of a booster separation switch.

TA 8 Lifting and transporting a missile or missile sections with a forklift truck and/or a forklift crane.

TA 9 Lifting and transporting a missile or missile sections with an electrically powered hoist.

TA 10 Pressurizing containers with a low pressure air supply.

TA 11 Removing a missile or a missile section from a container or inserting a missile section into a container by manipulating canning stand levers, rams, etc.

TA 12 Removing and replacing missile sections and parts in containers by hand.

TA 13 Removing and replacing missile sections in containers with an electrically powered hoist.

TA 14 Removing and replacing supporting devices and packing in containers by hand with hand tools.

TA 15 Securing straps and braces around a missile, missile sections, or missile containers.

TA 16 Inspecting the position of a safe-and-arm device.

TA 17 Setting a safe-and-arm device with a special tool.

TA 18 Transporting a missile or missile sections by hand on a stand, dolly or hydraulic-lift hand truck.

TA 19 Inspecting propulsive grain for cracks.

General Task TB--Assembly

TB 1 Aligning and mating missile sections by manipulating assembly stand levers, roll cages, etc.

TB 2 Attaching and detaching wings and rollerons by hand and with snap-ring expanders.

TB 3 Cleaning missile section mating surfaces.

TB 4 Attaching grounding wires to missile sections for safety during assembling.

TB 5 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws.

TB 6 Inspecting the position of missile parts for accuracy of assembly.

TB 7 Lubricating missile section mating surfaces.

TB 8 Mating missile sections by turning locking rings with a specially designed spanner wrench.

TB 9 Reading mechanical assembly drawings.

TB 10 Securing missile sections to an assembly stand with straps.

TB 11 Inspecting the position of a safe-and-arm device.

TB 12 Setting a safe-and-arm device with a special tool.

TB 13 Installing and assembling missile parts by hand with hand tools:

screws, spacers, and washers
pins
locking rings
snap rings
hydraulic and electrical line protective caps
screwdriver
strap wrench
special designed spanner wrench
snap ring expanders
safe-and-arm tool
assembly-test stand

Task TC--Evacuating and Charging a Missile Hydraulic System by Means of a Vacuum Pump Hydraulic Charging Unit and a Source of High Pressure Air

TC 1 Connecting and disconnecting electrical cables, between an hydraulic charging unit and a power supply in preparation for charging a missile hydraulic system.

TC 2 Connecting and disconnecting high pressure air lines between an hydraulic charging unit and a source of high pressure air.

TC 3 Connecting and disconnecting high pressure hydraulic lines between an hydraulic charging unit and a missile.

TC 4 Opening and closing valves and setting switches to prescribed positions with reference to sight gages and pressure gages to fill the fluid reservoir in an hydraulic charging unit.

TC 5 Opening and closing valves and setting switches to filter hydraulic fluid in a charging unit; timing the filter operation.

TC 6 Opening and closing valves and setting switches on an hydraulic charging unit with reference to gages to evacuate a missile hydraulic system; cycling a missile hydraulic pump by alternating the position of a toggle switch on a charging unit; timing the evacuation operation.

TC 7 Opening and closing valves and setting switches on an hydraulic charging unit with reference to a temperature gage and a temperature-pressure compensation chart to charge a missile hydraulic system.

TC 8 Cycling a missile hydraulic pump by alternating the position of a toggle switch on an hydraulic charging unit during hydraulic charging.

TC 9 Checking the position of a missile sump low pressure piston with a special measuring device to check the functioning of a charged missile hydraulic system.

Task TD--Charging a Missile Sump with High Pressure Nitrogen from Pressurized Bottles

TD 1 Connecting and disconnecting high pressure air lines between a nitrogen storage bottle and a missile.

TD 2 Opening and closing nitrogen supply valves with reference to pressure gages, ambient temperature gages and a temperature-compensation chart to charge a missile sump.

Task TE--Charging a Missile High Pressure Air Storage Bottle

TE 1 Removing and replacing a missile section casing by hand and with hand tools in preparation for missile servicing.

TE 2 Connecting and disconnecting high pressure air lines between a nitrogen storage bottle and a missile.

TE 3 Setting a firing pin by hand; disconnecting a plug during missile servicing.

TE 4 Closing an air circuit valve with a screwdriver in preparation for charging a missile air storage bottle.

TE 5 Opening and closing a nitrogen supply valve with reference to pressure gages, an ambient thermometer and a temperature-pressure compensation chart, to charge a missile air storage bottle.

TE 6 Locking an air volve closed by hand and with a special jack upon completion of charging a missile air storage bottle.

General Task RA--Handling and Transfer

RA 1 Attaching a tow bar to a missile.

RA 2 Attaching and detaching truck bed tie-down cables, chains and supports by hand and with hand tools.

RA 3 Attaching slings and sling lifting attachments to a missile or missile containers by hand and with hand tools.

RA 4 Bolting struts within a missile and securing bolts with pins and safety wire to permit a missile to be hoisted on slings.

RA 5 Cranking a missile by hand to a decanning position on a truck bed.

RA 6 Detaching container straps from around a missile.

RA 7 Directing crane operators with hand signals.

RA 8 Handling guy wires to control a missile container lid as it is lifted by a crane.

RA 9 Inspecting propulsive grain for cracks and tightness.

RA 10 Positioning a missile on jacks, or with a special lifting rig, with reference to inclinometers.

RA 11 Lifting and transferring a missile and missile containers with a crane.

RA 12 Lifting the covers from missile containers with a crane.

RA 13 Lifting, positioning and locking submarine hangar tracks by hand.

RA 14 Releasing missile container catches by hand.

RA 15 Unlocking and removing a combination lock to open a missile container.

RA 16 Removing or placing missile parts and components in wooden crates and storage cans.

RA 17 Removing lock rods by hand from missile containers.

RA 18 Removing packing materials by hand from a missile container.

RA 19 Stowing missiles in submarine hangars by operating a control panel with stop-start buttons, 3-position valves, a hand wheel, and gages.

RA 20 Transporting missiles by truck and/or trailers.

RA 21 Transporting missiles on dollies by hand.

RA 22 Transporting portable launchers with trucks and/or jeeps.

RA 23 Transporting portable servicing, power supply, and test equipment vans with trucks and/or jeeps.

General Task RB--Assembly

RB 1 Applying thread sealant to igniter threads during final assembly before launching.

RB 2 Attaching shorting plugs to igniter leads during final assembly before launching.

RB 3 Bore sighting a booster with a target, an alignment jig, a plumb bob, and spanner wrenches.

RB 4 Cleaning missile parts assembly surfaces.

RB 5 Connecting electrical wires and cables between missile parts by hand and with hand tools during missile assembly.

RB 6 Folding and spreading wings by setting missile switch controls.

RB 7 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws.

RB 8 Positioning a missile on jacks or with a special lifting rig with reference to inclinometers.

RB 9 Leveling booster supports by adjusting set screws with reference to a spirit level.

RB 10 Lifting and positioning a booster on a manually operated chain hoist.

RB 11 Reading electrical wiring diagrams.

RB 12 Reading mechanical assembly drawings.

RB 13 Removing and replacing missile fuselage access ports and cover plates with hand tools during missile assembly.

RB 14 Taping igniter leads to a missile fuselage during final assembly before launching.

RB 15 Unfolding and locking rudders and fins by hand and with hand tools.

RB 16 Installing and assembling missile parts by hand and with hand tools:

bolts, washers, nuts
gaskets and rings
jam nuts
pins
ball and socket adjusting bolts
plain screws
thumbscrews
set screws
concentric rings
half ring eccentrics
tie-rods
spacer rods
clamps
adjustment studs
spring compressing rods and spring retainers
"O" rings and pistons
safety wire
sealing tape

open-end wrenches
adjustable wrenches
torque wrench
spanner wrench
drive socket set
screwdrivers
hammer
scribe
files and emery paper

Task RC--Charging a Missile Autopilot Hydraulic System with Hydraulic Fluid

RC 1 Removing and replacing missile access ports by hand and with hand tools in preparation for missile servicing.

RC 2 Connecting and disconnecting high pressure hydraulic lines between a missile and an hydraulic charging unit.

RC 3 Connecting and disconnecting high pressure and low pressure hydraulic lines to open and close a missile hydraulic system.

RC 4 Opening and closing valves on an hydraulic charging unit with reference to gages to charge an autopilot hydraulic system.

RC 5 Connecting and disconnecting a servo valve control box from missile servo valves during the charging of a missile hydraulic system.

RC 6 Setting switches on a control box to cycle missile surfaces during hydraulic charging.

RC 7 Bleeding air from an hydraulic system with a hand pump with reference to a pressure gage.

RC 8 Inspecting hydraulic lines and an hydraulic system for leaks during the charging of a missile hydraulic system.

General Task SA--Handling and Transfer

SA 1 Attaching and detaching lifting attachments by hand and with hand tools.

SA 2 Lifting and carrying a missile and missile parts by hand.

SA 3 Lifting and positioning a missile on a manually operated chain hoist.

SA 4 Lifting and transporting missiles with electrically powered hoists.

SA 5 Securing a missile on a checkout stand with rings and clamps.

SA 6 Removing missile sections from hermetically sealed cans.

SA 7 Securing and releasing a missile and missile parts from specially designed stowage racks.

SA 8 Transporting a missile on a modified bomb trailer or missile trailer with a jeep or truck.

SA 9 Transporting a missile on checkout stands and with dollies by hand.

SA 10 Inspecting propulsive grain for cracks.

SA 11 Checking that trailers are grounded.

SA 12 Inspecting an arming lanyard for "safe" position.

SA 13 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws.

General Task SB--Assembly

SB 1 Adjusting eccentric pins and slides with reference to a wing deflection protractor to align wings.

SB 2 Aligning and mating missile sections by manipulating assembly stand knobs, roll cages, etc.

SB 3 Connecting electrical wires and cables between missile parts during missile assembly by hand and with hand tools.

SB 4 Checking accuracy of battery installation by listening and watching for shorting or arcing.

SB 5 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws; smoothing nicks on the edges of wings according to standard propeller maintenance procedures when necessary.

SB 6 Reading electrical wiring diagrams.

SB 7 Reading mechanical assembly drawings.

SB 8 Inspecting the position of a safe-and-arm device.

SB 9 Setting a safe-and-arm device.

SB 10 Installing and assembling missile parts by hand and with hand tools:

screws and lockwashers
thumbscrews
Allen set screws
bolts
pins
gaskets
retainer rings
shorting clips
safety wire
sealing tape

open-end wrenches
spin wrench
Allen wrenches
specially designed
spanner wrench
special nozzle wrench
special igniter wrench
common screwdriver
Phillips screwdriver
Reed-Prince screwdriver
drift pin
drift pin punch
rawhide mall
hammer
pliers
assembly-test stand

Task SC--Charging a Missile Accumulator Unit with Hydraulic Fluid and Nitrogen

SC 1 Connecting and disconnecting electrical cables between a missile, a preflight test console and an hydraulic charging unit in preparation for charging a missile hydraulic system.

SC 2 Connecting and disconnecting high pressure hydraulic lines between a missile and an hydraulic charging unit.

SC 3 Inspecting hydraulic fluid and fittings for cleanliness prior to charging a missile hydraulic system.

SC 4 Checking that a missile servo-amplifier unit is moving hydraulic valves during the charging of a missile hydraulic system.

SC 5 Connecting and disconnecting a high pressure nitrogen line between a nitrogen storage bottle and a missile.

SC 6 Opening and closing air valves with reference to gages to charge a missile accumulator unit with nitrogen.

SC 7 Opening and closing valves and setting switches on an hydraulic charging unit, with reference to gages, and rocking wings back and forth by hand or wrench to charge a missile hydraulic system.

SC 8 Cocking an hydraulic system arming mechanism with a screwdriver and lever, after charging a missile hydraulic system.

SC 9 Discharging hydraulic pressure from an hydraulic accumulator.

Task SD--Filling Battery Cells with Electrolyte Solution

SD 1 Removing and replacing screws to disassemble and reassemble two battery housing halves during missile battery servicing.

SD 2 Preparing battery electrolyte from dry chemicals and distilled water while controlling solution temperature.

SD 3 Inserting an hypodermic syringe needle and an air bleeder needle into rubber grommetts and metal housing holds in a battery; injecting a measured amount of potassium hydroxide into each battery cell.

SD 4 Wiping a battery clean of electrolyte solution.

SD 5 Determining the specific gravity of a chemical solution with a standard hydrometer.

SD 6 Inspecting a battery and wiring for damage or flaws.

Task SE--General Periodic Servicing of Test Consoles

SE 1 Inspecting test console air filters for cleanliness and flaws.

SE 2 Cleaning or replacing air filters in test consoles when inspections find it necessary.

SE 3 Inspecting test console oil filters for cleanliness and flaws.

SE 4 Cleaning or replacing test console oil filters when inspections find it necessary.

SE 5 Inspecting samples of hydraulic fluid for presence of dirt, sludge, water, etc.

SE 6 Checking the oil level of test console drive transmissions.

SE 7 Adding oil to test console drive transmissions when inspections find it necessary.

SE 8 Changing the oil in test console hydraulic systems periodically.

SE 9 Greasing test console hydraulic pumps with a standard grease gun.

SE 10 Greasing test console motors, bearings, and bushings.

General Task PA--Handling and Transfer

PA 1 Directing crane and forklift operators with hand signals and spoken signals.

PA 2 Lifting and carrying missile sections by hand.

PA 3 Lifting and transporting missile sections on an A-frame and a manually operated chain fall hoist.

PA 4 Lifting and transporting missile sections with a crane.

PA 5 Securing missile units on assembly stands with retaining straps.

PA 6 Transporting canned missile sections on a forklift truck.

PA 7 Transporting missile sections on a dolly by hand.

PA 8 Transporting missiles on a traveloader.

PA 9 Removing missile sections from metal containers.

PA 10 Elevating missiles to engage pylons on parent aircraft using a traveloader.

PA 11 Securing missiles to parent aircraft by making electrical and mechanical attachments by hand and with hand tools.

General Task PB--Assembly

PB 1 Aligning air surface trim tabs by hand and with hand tools with reference to a decalage neutral gage, a clinometer, and a setting chart.

PB 2 Attaching air surfaces by hand with reference to a deflection gage.

PB 3 Attaching slings and lifting attachments to missile sections by hand and with hand tools.

PB 4 Checking the action of spring-loaded lugs in quick-disconnect receptacles during missile assembly.

PB 5 Cleaning missile parts assembly surfaces.

PB 6 Connecting electrical wires and cables between missile parts during missile assembly by hand and with hand tools.

PB 7 Connecting plug-in and screw-in air lines during missile assembly.

PB 8 Connecting plug-in and screw-in fuel lines during missile assembly.

PB 9 Setting an arming device with hand tools.

PB 10 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws.

PB 11 Installing a squib in a missile by hand and with hand tools during missile assembly.

PB 12 Installing release and act /ating lanyards by hand.

PB 13 Lifting and positioning missile sections by hand for assembly.

PB 14 Lifting and positioning missile sections on a manually operated chain hoist.

PB 15 Lifting and positioning missile sections with electrically powered hoists.

PB 16 Reading electrical wiring diagrams.

PB 17 Reading mechanical assembly drawings.

PB 18 Removing and replacing missile bolt covers with hand tools during missile assembly.

PB 19 Securing and protecting electrical wires with electrical tape during missile assembly.

PB 20 Opening missile and air circuit valves by hand and with a special wrench during missile assembly.

PB 21 Installing and assembling missile sections and parts by hand and with hand tools:

bolts, washers and nuts
pins
jam-nuts
basket nuts
lock washers
screws
thumbscrews
clips
clamps
special clamp assembly
retaining rings
gasket and torpedo adapter
latches
camlocs
suspension lugs
splined shaft attachment
drive shaft assembly fitting
straps
safety wire

open-end wrenches
torque wrenches
T-handle wrench
torpedo wrench
socket wrench
ratchet and socket
screwdrivers
pliers
rawhide mall
file

DOVE

General Task DA--Handling and Transfer

DA 1 Attaching a special lifting handle to missile section with wing head screws.

DA 2 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws.

DA 3 Lifting missile parts from containers by hand and with a manually operated chain hoist.

DA 4 Removing container covers with hand tools.

DA 5 Removing supporting devices and packing from containers by hand and with hand tools.

DA 6 Transporting missile parts with an electrically powered hoist.

DA 7 Removing covers from hermetically sealed containers with hand tools.

General Task DB--Assembly

DB 1 Connecting electrical cables between missile parts during missile assembly.

DB 2 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws.

DB 3 Lubricating missile section mating surfaces.

DB 4 Reading electrical wiring diagrams.

DB 5 Reading mechanical assembly drawings.

DB 6 Checking whether gimbals move while rotating a missile gyro before assembling the gyro in a missile.

DB 7 Installing and assembling missile sections and parts by hand and with hand tools:

bolts, nuts, washers
elastic stop-nut
common screws
Allen set screws
thumbscrew
pins
latch
lock ring

open-end wrenches
socket wrench
box wrench
Allen wrench
special locking wrench
special T-handle Allen wrench
screwdriver
pliers

spacer and splines
knock-out plugs
Dzus fasteners
bungie arming wire
safety wire

aligning drift punch
Dzus keys

Task DC--Charging a Tail Pneumatic System with Nitrogen

DC 1 Removing and replacing a missile charging port cover and a valve cap by hand and with a screwdriver in preparation for missile servicing.

DC 2 Cocking a tail arming mechanism with a special cocking wrench; locking an arming mechanism with a safety pin after charging a missile pneumatic system.

DC 3 Opening and closing a nitrogen charging valve with reference to a charging gage and a gas cylinder pressure gage to charge a missile pneumatic system.

DC 4 Opening a vent on a gas cylinder valve assembly to bleed the pressure from a hose.

DC 5 Connecting and disconnecting a high pressure nitrogen line and a charging gage between a nitrogen storage bottle and a missile with a special wrench.

Task DD--Charging a Nose Pneumatic System with Nitrogen

DD 1 Removing and replacing a missile cover plug by hand and with a screwdriver in preparation for missile servicing.

DD 2 Opening a nitrogen charging valve with a special bleeding tool to bleed a missile pneumatic system.

DD 3 Cocking an arming mechanism with a screwdriver; locking an arming mechanism with a safety pin after charging a missile pneumatic system.

DD 4 Connecting and disconnecting a high pressure nitrogen line and a charging gage between a nitrogen storage bottle and a missile with a special wrench.

DD 5 Opening and closing valves on a nitrogen line with reference to a charging gage to charge a missile pneumatic system.

APPENDIX E

HANDLING, ASSEMBLY AND SERVICING: BEHAVIORAL CATEGORIES AND ASSOCIATED BEHAVIOR STATEMENTS, ALL MISSILES COMBINED

APPENDIX E

HANDLING, ASSEMBLY AND SERVICING:
BEHAVIORAL CATEGORIES AND ASSOCIATED BEHAVIOR STATEMENTS,
ALL MISSILES COMBINED

1. Assembling and Disassembling Missiles by Hand and with Hand Tools.

SB 2 Aligning and mating missile sections by manipulating assembly stand knobs, roll cages, etc.

TB 1 Same as SB 2.

TB 8 Mating missile sections by turning locking rings with a specially designed spanner wrench.

RB 15 Unfolding and locking rudders and fins by hand and with hand tools.

TB 2 Attaching and detaching wings and rollerons by hand and with snapring expanders.

RB 6 Folding and spreading wings by setting missile switch controls.

PB 18 Removing and replacing missile bolt covers with hand tools during missile assembly.

RB 13 Removing and replacing missile fuselage access ports and cover plates with hand tools during missile assembly.

RC 1 Removing and replacing missile access ports by hand and with hand tools in preparation for missile servicing.

TE 1 Removing and replacing a missile section casing by hand and with hand tools in preparation for missile servicing.

DD 1 Removing and replacing a missile cover plug by hand and with a screwdriver in preparation for missile servicing.

DC 1 Removing and replacing a missile charging port cover and a valve cap by hand and with a screwdriver in preparation for missile servicing.

PB 7 Connecting plug-in and screw-in air lines during missile assembly.

PB 12 Installing release and activating lanyards by hand.

PB 8 Connecting plug-in and screw-in fuel lines during missile assembly.

PB 9 Setting an arming device with hand tools.

TA 17 Setting a safe-and-arm device with a special tool.

TB 12 Same as TA 17.

SB 9 Setting a safe-and-arm device.

TE 3 Setting a firing pin by hand; disconnecting a plug during missile servicing.

SC 8 Cocking a hydraulic system arming mechanism with a screwdriver and lever after charging a missile hydraulic system.

PB 20 Opening missile air circuit valves by hand and with a special wrench during missile assembly.

DC 2 Cocking a tail arming mechanism with a special cocking wrench; locking an arming mechanism with a safety pin after charging a missile pneumatic system.

DD 3 Cocking an arming mechanism with a screwdriver; locking an arming mechanism with a safety pin after charging a missile pneumatic system.

TB 13 Installing and assembling missile parts by hand and with hand tools:

screws, spacers, and washers	screwdriver
pins	strap wrench
locking rings	special designed spanner
snap rings	wrench
hydraulic and electrical	snap ring expanders
line protective caps	safe-and-arm tool
	assembly-test stand

RB 16 Installing and assembling missile parts by hand with hand tools:

bolts, washers, nuts	open-end wrenches
gaskets and rings	adjustable wrenches
jam nuts	torque wrench
pins	spanner wrench
ball and socket adjusting bolts	drive socket set
plain screws	screwdrivers
thumbscrews	hammer
set screws	scribe
concentric rings	files and emery paper
half-ring eccentrics	
tie-rod	

(Cont'd on next page)

RP 16 (Cont'd)
spacer rods
clamps
adjustment studs
spring compressing rods and spring retainers
"O" rings and pistons
safety wire
sealing tape

SB 10 Installing and assembling missile parts by hand and with hand tools:

screws and lockwashers
thumbscrews
Allen set screws
bolts
pins
gaskets
retainer rings
shorting clips
safety wire
sealing tape

open-end wrenches
spin wrench
Allen wrenches
specially designed
spanner wrench
special nozzle wrench
special igniter wrench
common screwdriver
Phillips screwdriver
Reed-Prince screwdriver
drift pin
drift pin punch
rawhide mall
hammer
pliers
assembly-test stand

PB 20 Installing and assembling missile sections and parts by hand and with hand tools:

bolts, washers and nuts
pins
jam-nuts
basket nuts
lock washers
screws
thumbscrews
clips
clamps
special clamp assembly
retaining rings
gasket and torpedo adapter
latches
camlocs
suspension lugs
splined shaft attachment
drive shaft assembly fitting
straps
safety wire

open-end wrenches
torque wrenches
T-handle wrench
torpedo wrench
socket wrench
ratchet and socket
screwdrivers
pliers
rawhide mall
file

DB 7 Installing and assembling missile sections and parts by hand and with hand tools:

bolts, nuts, washers	open-end wrenches
elastic stop-nut	socket wrench
common screws	box wrench
Allen set screws	Allen wrench
thumbscrews	special locking wrench
pins	special T-handle wrench
latch	screwdriver
lock ring	pliers
spacer and splines	aligning drift punch
knock-out plugs	Dzus keys
Dzus fasteners	
bungie arming wire	
safety wire	

2. Attaching, Securing, and Detaching to Lift, Haul and Secure Missiles and Associated Equipment.

RA 2 Attaching and detaching truck bed tie-down cables, chains and supports by hand with hand tools.

TA 2 Attaching slings and lifting attachments to a missile, missile sections or missile containers by hand and with hand tools.

RA 3 Attaching slings and sling lifting attachments to a missile or missile containers by hand and with hand tools.

PB 3 Attaching slings and lifting attachments to missile sections by hand and with hand tools.

RA 4 Bolting struts within a missile and securing bolts with pins and safety wire to permit a missile to be hoisted on slings.

DA 1 Attaching a special lifting handle to a missile section with wing head screws.

SA 1 Attaching and detaching lifting attachments by hand and with hand tools.

SA 5 Securing a missile on a checkout stand with rings and clamps.

TB 10 Securing missile sections to an assembly stand with straps.

PA 5 Securing missile units on assembly stands with retaining straps.

TA 15 Securing straps and braces around a missile, missile sections, or missile containers.

SA 7 Securing and releasing a missile and missile parts from specially designed stowage racks.

RA 1 Attaching a tow bar to a missile.

PA 11 Securing missiles to parent aircraft by making electrical and mechanical attachments by hand and with hand tools.

3. Checking and Inspecting During Missile Transfer, Assembly, and Servicing:

DB 2 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws.

RB 7 Same as DB 2.

PB 10 Same as DB 2.

TB 5 Same as DB 2.

DA 2 Same as DB 2.

SA 13 Same as DB 2.

TA 6 Same as DB 2.

SB 5 Inspecting the external surfaces of a missile and missile parts for indications of damage or flaws; smoothing nicks on the edges of wings according to standard propellor maintenance procedures when necessary.

TB 6 Inspecting the position of missile parts for accuracy of assembly.

SB 8 Inspecting the position of a safe-and-arm device.

TA 16 Same as SB 8.

TB 11 Same as SB 8.

TA 7 Inspecting the position of a booster separation switch.

SA 12 Inspecting and arming lanyard for "safe" position.

SA 11 Checking that trailers are grounded.

SA 10 Inspecting propulsive grain for cracks.

TA 19 Same as SA 10.

RA 9 Inspecting propulsive grain for cracks and tightness.

SC 3 Inspecting hydraulic fluid and fittings for cleanliness prior to charging a missile hydraulic system.

SE 5 Inspecting samples of hydraulic fluid for presence of dirt, sludge, water, etc.

SE 3 Inspecting test console oil filters for cleanliness and flaws.

SE 6 Checking the oil level of test console drive transmissions.

SE 1 Inspecting test console air filters for cleanliness and flaws.

RC 8 Inspecting hydraulic lines and an hydraulic system for leaks during the charging of a missile hydraulic system.

SB 4 Checking accuracy of battery installation by listening and watching for shorting or arcing.

SD 6 Inspecting a battery and wiring for damage or flaws.

PB 4 Checking the action of spring-loaded lugs in quick-disconnect receptacles during missile assembly.

TC 9 Checking the position of a missile sump low pressure pis[illegible] with a special measuring device to check the [illegible] of a charged missile hydraulic system.

[illegible] for whether gimbals move while rotating a missile [illegible] assembling the gyro in a missile.

[illegible] that a missile servo-amplifier unit is moving [illegible] valves during the charging of a missile [illegible] system.

4. Connecting and Disconnecting High Pressure Air and Hydraulic Lines During Missile Air and Hydraulic Servicing.

TE 2 Connecting and disconnecting high pressure air lines between a nitrogen storage bottle and a missile.

TD 1 Same as TE 2.

DC 5 Connecting and disconnecting a high pressure nitrogen line and a charging gage between a nitrogen storage bottle and a missile with a special wrench.

DD 4 Same as DC 5.

SC 5 Same as TE 2.

TC 2 Connecting and disconnecting high pressure air lines between a hydraulic charging unit and a source of high pressure air.

RC 2 Connecting and disconnecting high pressure hydraulic lines between a missile and a hydraulic charging unit.

SC 2 Same as RC 2.

TC 3 Same as RC 2.

RC 3 Connecting and disconnecting high pressure and low pressure hydraulic lines to open and close a missile hydraulic system.

RC 7 Bleeding air from a hydraulic system with a hand pump with reference to a pressure gage.

5. Connecting and Installing Electrical Wires, Cables, and Parts During Missile Transfer, Assembly, and Servicing.

SB 3 Connecting electrical wires and cables between missile parts during missile assembly by hand and with hand tools.

RB 5 Same as SB 3.

PB 6 Same as SB 3.

DB 1 Connecting electrical cables between missile parts during missile assembly.

SC 1 Connecting and disconnecting electrical cables between a missile, a preflight test console and a hydraulic charging unit in preparation for charging a missile hydraulic system.

PB 19 Securing and protecting electrical wires with electrical tape during missile assembly.

RB 2 Attaching shorting plugs to igniter leads during final assembly before launching.

RB 1 Applying thread sealant to igniter threads during final assembly before launching.

RB 14 Taping igniter leads to a missile fuselage during final assembly before launching.

RC 5 Connecting and disconnecting a servo valve control box from missile servo valves; during the charging of a missile hydraulic system.

TC 1 Connecting and disconnecting electrical cables, between a hydraulic charging unit and a power supply in preparation for charging a missile hydraulic system.

TA 5 Attaching grounding wires to missile sections and containers for safety during handling.

TB 4 Attaching grounding wires to missile sections for safety during assembling.

PB 11 Installing a squib in a missile by hand and with hand tools during missile assembly.

6. Leveling, Positioning, and Measuring to Align Missile Air Surfaces and Rockets.

PB 1 Aligning air surface trim tabs by hand and with hand tools with reference to a decalage neutral gage, a clinometer, and a setting chart.

PB 2 Attaching air surfaces by hand with reference to a deflection gage.

RB 3 Bore sighting a booster with a target, an alignment jig, a plumb bob, and spanner wrenches.

RB 9 Leveling booster supports by adjusting set screws with reference to a spirit level.

SB 1 Adjusting eccentric pins and slides with reference to a wing deflection protractor to align wings.

7. Locking-Unlocking, Assembling-Disassembling, Packing-Unpacking and Pressurizing-Bleeding to Remove and Replace Missiles and Missile Parts in Containers.

RA 6 Detaching container straps from around a missile.

RA 14 Releasing missile container catches by hand.

RA 15 Unlocking and removing a combination lock to open a missile container.

RA 17 Removing lock rods by hand from missile containers.

DA 4 Removing container covers with hand tools.

TA 1 Assembling and disassembling missile containers with a pneumatic wrench and special hand tools.

PA 9 Removing missile sections from metal containers.

SA 6 Removing missile sections from hermetically sealed cans.

DA 7 Removing covers from hermetically sealed containers with hand tools.

RA 16 Removing or placing missile parts and components in wooden crates and storage cans.

RA 18 Removing packing materials by hand from a missile container.

DA 5 Removing supporting devices and packing from containers by hand and with hand tools.

TA 14 Removing and replacing supporting devices and packing in containers by hand and with hand tools.

TA 12 Removing and replacing missile sections and parts in containers by hand.

DA 3 Lifting missile parts from containers by hand and with a manually operated chain hoist.

TA 11 Removing a missile or a missile section from a container or inserting a missile section into a container by manipulating canning stand levers, rams, etc.

TA 3 Bleeding low pressure air from missile containers by releasing Shraeder valves.

TA 10 Pressurizing containers with a low pressure air supply.

8. Lubricating, Cleaning, and Battery Maintenance During Missile Assembly and Servicing.

TB 3 Cleaning missile section mating surfaces.

RB 4 Cleaning missile parts assembly surfaces.

PB 5 Same as RB 4.

SE 2 Cleaning or replacing air filters in test consoles when inspections find it necessary.

SE 4 Cleaning or replacing test console oil filters when inspections find it necessary.

DB 3 Lubricating missile section mating surfaces.

TB 7 Same as DB 3.

SE 10 Greasing test console motors, bearings, and bushings.

SE 9 Greasing test console hydraulic pumps with a standard grease gun.

SE 8 Changing the oil in test console hydraulic systems periodically.

SE 7 Adding oil to test console drive transmission when inspections find it necessary.

SO 2 Preparing battery electrolyte from dry chemicals and distilled water while controlling solution temperature.

SD 5 Determining the specific gravity of a chemical solution with a standard hydrometer.

SD 3 Inserting a hypodermic syringe need e and an air bleeder needle into rubber grommetts and m al housing holds in a battery; injecting a measured amount of potassium hydroxide into each battery cell.

SD 4 Wiping a battery clean of electrolyte solution.

9. Manually Pushing, Pulling, Lifting, Carrying, and Manipulating to Transport, Position, and Stow Missiles, Missile Parts, and Associated Equipment.

PA 2 Lifting and carrying missile sections by hand.

TA 4 Lifting and carrying missile sections and missile containers by hand.

SA 2 Lifting and carrying a missile and missile parts by hand.

PB 13 Lifting and positioning missile sections by hand for assembly.

PA 7 Transporting missile sections on a dolly by hand.

RA 21 Transporting missiles on dollies by hand.

SA 9 Transporting a missile on checkout stands and dollies by hand.

TA 18 Transporting a missile or missile sections by hand on a stand, dolly, or hydraulic lift hand truck.

PA 3 Lifting and transporting missile sections on an A-frame and a manually operated chain fall hoist.

SA 3 Lifting and positioning a missile on a manually operated chain hoist.

RB 10 Lifting and positioning a booster on a manually operated chain hoist.

PB 14 Lifting and positioning missile sections on a manually operated chain hoist.

RA 10 Positioning a missile on jacks or with a special lifting rig with reference to inclinometers.

RB 8 Positioning a missile on jacks or with a special lifting rig with reference to inclinometers.

RA 5 Cranking a missile by hand to a decanning position on a truck bed.

RA 8 Handling guy wires to control a missile container lid as it is lifted by a crane.

RA 13 Lifting, positioning, and locking submarine hangar tracks by hand.

10. Operating Motor Vehicles and Electrically Powered Equipment to Lift, Position, Transport, and Stow Missiles, Missile Parts and Associated Equipment:

TA 13 Removing and replacing missile sections in containers with an electrically powered hoist.

TA 9 Lifting and transporting a missile or missile sections with an electronically powered hoist.

DA 6 Transporting missile parts with an electrically powered hoist.

SA 4 Lifting and transporting missiles with electrically powered hoists.

PB 15 Lifting and positioning missile sections with electrically powered hoists.

PA 6 Transporting canned missile sections on a forklift truck.

TA 8 Lifting and transporting a missile or missile sections with a forklift truck and/or a forklift crane.

PA 8 Transporting missile on a traveloader.

PA 10 Elevating missiles to engage pylons on parent aircraft using a traveloader.

RA 12 Lifting the covers from missile containers with a crane.

RA 11 Lifting and transferring a missile and missile containers with a crane.

PA 4 Lifting and transporting missile sections with a crane.

RA 7 Directing crane operators with hand signals.

PA 1 Directing crane and forklift operators with hand signals. and spoken signals.

RA 22 Transporting portable launchers with trucks and/or jeeps.

RA 20 Transporting missiles by trucks and/or trailers.

RA 23 Transporting portable servicing, power supply, and test equipment vans with trucks and/or jeeps.

SA 8 Transporting a missile on a modified bomb trailer or missile trailer with a jeep or truck.

RA 19 Stowing missiles in submarine hangars by operating a control panel with stop-start buttons, 3-position valves, a hand wheel, and gages.

11. Reading Electrical and Mechanical Diagrams to Determine Missile Assembly Procedures:

RB 11 Reading electrical wiring diagrams.

SB 6 Reading electrical wiring diagrams.

PB 16 Reading electrical wiring diagrams.

DB 4 Reading electrical wiring diagrams.

TB 9 Reading mechanical assembly drawings.

RB 12 Reading mechanical assembly drawings.

SB 7 Reading mechanical assembly drawings.

PB 17 Reading mechanical assembly drawings.

DB 5 Reading mechanical assembly drawings.

12. Setting Valves and Switches and Reading Gages During Missile Air and Hydraulic Servicing.

TC 5 Opening and closing valves and setting switches to filter hydraulic fluid in a charging unit; timing and filtering operation.

TC 4 Opening and closing valves and setting switches to prescribed positions with reference to sight gages and pressure gages to fill the fluid reservoir in a hydraulic charging unit.

TC 7 Opening and closing valves and setting switches on a hydraulic charging unit with reference to a temperature gage and a temperature-pressure compensation chart to charge a missile hydraulic system.

SC 7 Opening and closing valves and setting switches on a hydraulic charging unit with reference to gages and rocking wings back and forth by hand or wrench to charge a missile hydraulic system.

RC 4 Opening and closing valves on a hydraulic charging unit with reference to gates to charge an autopilot hydraulic system.

SC 9 Discharging hydraulic pressure from a hydraulic accumulator.

RC 6 Setting switches on a control box to cycle missile surfaces during hydraulic charging.

TC 6 Opening and closing valves and setting switches on a hydraulic charging unit with reference to gages to evacuate a missile hydraulic system; cycling a missile hydraulic pump by alternating the position of a toggle switch on a charging unit; timing the evacuation operation.

TC 8 Cycling a missile hydraulic pump by alternating the position of a toggle switch on a hydraulic charging unit during hydraulic charging.

TE 5 Opening and closing nitrogen supply valve with reference to pressure gages, an ambient temperature thermometer and a temperature-pressure compensation chart to charge a missile air storage bottle.

DC 3 Opening and closing a nitrogen charging valve with reference to a charging gage and a gas cylinder pressure gage to charge a missile pneumatic system.

DD 5 Opening and closing valves on a nitrogen line with reference to a charging gage to charge a missile pneumatic system.

TD 2 Opening and closing nitrogen supply valves with reference to pressure gages, ambient temperature gages and a temperature-compensation chart to charge a missile sump.

SC 6 Opening and closing air valves with reference to gages to charge a missile accumulator unit with nitrogen.

TE 4 Closing an air circuit valve with a screwdriver in preparation for charging a missile air storage bottle.

TE 6 Locking an air valve closed by hand and with a special jack upon completion of charging a missile air storage bottle.

DC 4 Opening a vent on a gas cylinder valve assembly to bleed the pressure from a hose.

DD 2 Opening a nitrogen charging valve with a special bleeding tool to bleed a missile pneumatic system.